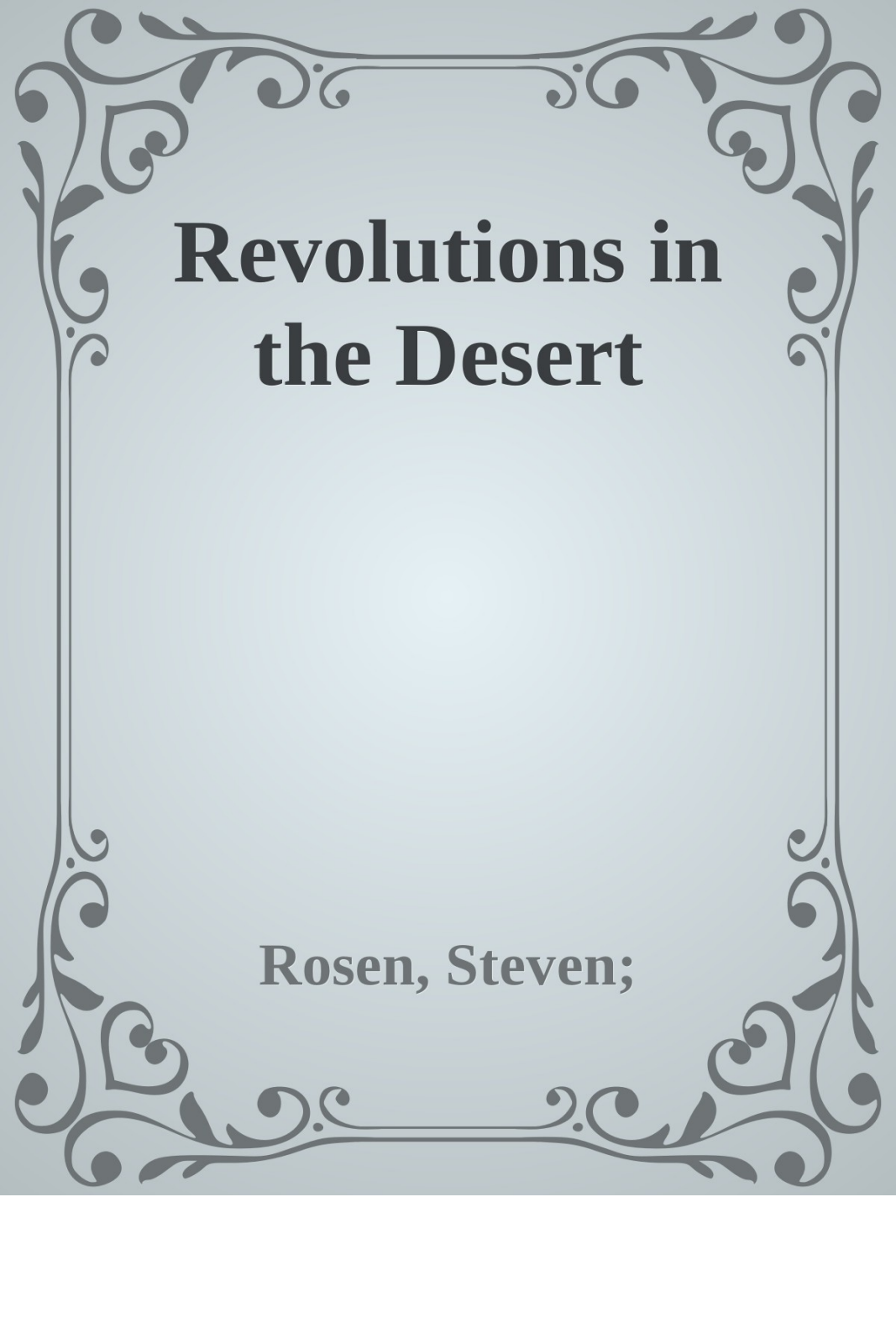


A decorative border with intricate floral and scrollwork patterns, rendered in a light gray color, framing the entire page.

Revolutions in the Desert

Rosen, Steven;

VISIT...

LANZAROTE
Caliente.COM

REVOLUTIONS IN THE DESERT

THE RISE OF MOBILE PASTORALISM
IN THE SOUTHERN LEVANT

STEVEN A ROSEN



REVOLUTIONS IN THE
DESERT

THE RISE OF MOBILE PASTORALISM
IN THE SOUTHERN LEVANT

STEVEN A ROSEN

ROUTLEDGE 

Revolutions in the Desert

Revolutions in the Desert investigates the development of pastoral nomadism in the arid regions of the ancient Near East, challenging the prevailing notion that such societies left few remains appropriate for analytic study. Few prior studies have approached the deeper past of desert nomadic societies, which have been primarily recognized only as a complement to the study of sedentary agricultural societies in the region. Based on decades of archaeological fieldwork in the Negev of southern Israel, both excavations and surveys, and integrating materials from adjacent regions, *Revolutions in the Desert* offers a deeper and more dynamic view of the rise of herding societies beyond the settled zone.

Rosen offers the first archaeological analysis of the rise of herding in the desert, from the first introduction of domestic goats and sheep into the arid zones, more than eight millennia ago, to the evolution of more-recent Bedouin societies. The adoption of domestic herds by hunter-gatherer societies, contemporary with and peripheral to the first farming settlements, revolutionized all aspects of desert life, including subsistence, trade, cult, social organization, and ecology. Inviting processual comparison to the agricultural revolution and the secondary spread of domestication beyond the Near East, this volume traces the evolution of nomadic societies in the archaeological record and examines their ecological, economic, and social adaptations to the deserts of the Southern Levant. With maps and illustrations from the author's own collection, *Revolutions in the Desert* is a thoughtful and engaging approach to the archaeology of desert nomadic societies.

Steven A Rosen holds the Canada Chair in Near Eastern Archaeology at Ben-Gurion University of the Negev. He has published five previous books, along with over 150 professional papers, and he is also a member of the scientific board of *Paléorient*, a member of the board of directors of the Israel Prehistoric Society, and sits on the Archaeological Council of Israel. He has conducted fieldwork in Israel and Turkey, including a number of excavations and surveys in the Negev region.

Revolutions in the Desert

The Rise of Mobile Pastoralism in the Southern Levant

Steven A Rosen

 **Routledge**
Taylor & Francis Group
NEW YORK AND LONDON

First published 2017
by Routledge
711 Third Avenue, New York, NY 10017

and by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2017 Steven A Rosen

The right of Steven A Rosen to be identified as author of this work has been asserted by him in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Library of Congress Cataloging in Publication Data

Names: Rosen, Steven A, author.

Title: Revolutions in the desert : the rise of mobile pastoralism in the Negev

and the arid zones of the Southern Levant / Steven A Rosen.

Description: First edition. | New York, NY : Routledge, [2017] |

Includes bibliographical references and index.

Identifiers: LCCN 2016046338 | ISBN 9781629585437 (hardback) |

ISBN 9781629585444 (pbk.)

Subjects: LCSH: Negev (Israel) | Israel—Antiquities. | Antiquities,

Prehistoric—Israel. | Excavations (Archaeology)—Israel. | Pastoral
systems—Israel—History—To 1500. | Bronze age—Israel—Negev. |
Bronze age—Middle East.

Classification: LCC DS111 .R585 2017 | DDC 933/.4901—dc23

LC record available at <https://lcn.loc.gov/2016046338>

ISBN: 978-1-62958-543-7 (hbk)

ISBN: 978-1-62958-544-4 (pbk)

ISBN: 978-1-315-39994-2 (ebk)

Typeset in Bembo
by Apex CoVantage, LLC

To my grandparents, Hyman and Fanny Rosen, and Sarah Raskin I would like to think they would have been proud to see what I have done after growing up.

Contents

Cover

Title

Copyright

Dedication

CONTENTS

List of Illustrations

Acknowledgments

1 Beyond History: The Importance of an Archaeology of Pastoral Nomadism

An Introductory Mythology

The Role of Archaeology

The Goals of This Study

A Note on the Chronological Framework

2 The Problem of Domestication

The Range of Domesticates

Identifying Domestication

Herd Animals in the Near East: A Preview to the Archaeological Sequence

3 The Problems of Definition: Variability in Pastoral Adaptations

Introduction

Herds, Other Animals, and Their Exploitation

Economy

Migrations and Seasonality

The Structures of Pastoral Nomadic Society

The Problem of Definition over Time

General Notes on Origins

Baselines, Fission, Adoption, and Economics

Issues of Causality

Summary

4 Invisibility and Visibility: A Background to the Archaeology of Pastoral Nomadism

Why We Have Not Seen the Nomads

The Structure of the Discipline

The Misapprehension of Mobile Pastoralism

How to See Nomads

Ancient Texts and Nomads

Ethnography, Ethnology, and the Study of Ancient Nomads

The Implications of Archaeological Methods

Integrating Texts, Ethnography, and Archaeology

5 The Environmental Background to the Rise of Pastoral Nomadism in the Southern Levantine Deserts

Introduction

Paleoenvironments and Climatic Change

The Early Holocene

The Middle Holocene

The Chalcolithic Period/Middle Timnian

The Bronze Age (Late Timnian, Terminal Timnian, and Second Millennium BCE)

The First Millennium BCE

The First Millennium CE

The Implications of Climatic Fluctuations

6 The Pre-Pottery Neolithic B Baseline: The Last Hunter-Gatherers in the Desert

Goats in the Pre-Pottery Neolithic B Heartland

The Origins of the Negev PPNB

Subsistence in the Desert in the PPNB

Architecture and Material Culture

Society in the Desert PPNB

Summary

7 The Earliest Herder-Gatherers: The Adoption of Domesticated

Animals in the Desert Periphery

Introduction

The Chrono-Cultural Framework

The Earliest Evidence

The First Desert Pastoralists: A Review Discussion

8 Revolution in the Desert: The Timnian Culture Complex and the Implications of Systematic Herding

Introduction

The Timnian Culture Complex

Definitions

Domestic Architecture and Settlement

Subsistence

Cult and Mortuary Sites

Material Culture

Rock Art

Revolution in the Desert: Integrating Processes in the Timnian Culture Complex

Conclusions: The Rise of Desert Tribal Society

9 Another Revolution: The Late Timnian, the Early Bronze Age, and the Rise of Economic Asymmetry

Introduction

The Late Timnian: A Description

Domestic Architecture and Settlement

Subsistence Systems

Cult and Mortuary Sites

Mobility and Seasonality

Material Culture

Pastoral Nomadism and the Rise of Economic Asymmetry

Demography and Social Organization

Economy

Multi-Resource Nomadism, Core and Periphery, and the Rise of Economic Asymmetry

10 Text and Relict: An Essay on the Archaeology of Desert Pastoralism
in the Historic Periods in the Negev

Prologue: The End of the Timnian Culture Complex

What Happened Next? 1. The Problem of the 2nd Millennium BCE

A Digression: Texts, Archaeology, and the Bedouin

*Explaining the 2nd Millennium Gap: A Model for Absence (Read
Decline, Scarcity, Abandonment, Etc.)*

*What Happened Next? 2. The Origins and Development of
Classical Period Nomadism*

11 Epilogue: An Archaeology of the End of Pastoral Nomadism

1700 and Beyond

An Archaeology of Recent Bedouin

After the Revolutions

References

Index

Illustrations

Tables

- 1.1 General Southern Levantine chronological framework including archaeological periods, radiocarbon chronology, calibrated radiocarbon chronology, and calendric chronology.
- 7.1 The Timnian Culture sequence compared to other sequences.
- 7.2 Radiocarbon and calibrated dates from the Ramon I Rock Shelter.
- 9.1 Summary table of imported and exported goods for Central Negev Timnian sites.
- 11.1 1st millennium CE radiocarbon dates from rock shelters in the Central Negev.

Figures

- 5.1 Map of the Levant with areas mentioned in chapter.
- 5.2 Schematic vegetation map of the Levant and its surrounding deserts.
- 5.3 General rainfall patterns in Levant.
- 5.4 General map of Negev, with phytogeographic communities.
- 5.5 Holocene rainfall sequence based on stable carbon and oxygen isotopes from the Soreq Cave, redrawn from Bar-Matthews and Ayalon (2004) with archaeological periods and calendric dates BP and CE/BCE.
- 6.1 Map showing sites and areas mentioned in chapter.
- 6.2 Graphs of arrowhead percentage decline, north and south.
- 6.3 Sample sickle segment frequencies according to location.
- 6.4 Ujrat el Mehed (Banana I).
- 6.5 Schematic of arrowhead types and chronology in the Negev, from the Neolithic through the Bronze Age.
- 6.6 Schematic map of PPNB subsistence geography after introduction of domestic goats into settled zone with models of upland-lowland mobility.
- 7.1 General map of Southern Levant during the transition to Herding-Gathering.
- 7.2 The stratigraphy and chronology of the Ramon I Rock Shelter.

- 7.3 Dung pellets from Ramon I Neolithic.
- 7.4 Har Qeren V.
- 8.1 Map of site and area locations for Early-Middle Timnian and sites mentioned in this chapter.
- 8.2 Enclosure and attached room sites.
- 8.3 Complex of clustered compounds from Early Bronze Age (Late Timnian) Site 29.
- 8.4 Google Earth satellite photograph of Bedouin encampment with enclosure and tent, Wadi Hisma, southern Jordan.
- 8.5 Desert kite in the Makhtesh Ramon.
- 8.6 Ramat Saharonim Shrine 4.
- 8.7 Nawamis tombs at Ein Hudera.
- 8.8 Tabular scraper cores from Har Michia.
- 8.9 Tabular scrapers.
- 8.10 Tabular scrapers (fragments) with incised symbols.
- 8.11 Finds from the Middle Timnian site of Nahal Tsafit.
- 8.12 Holemouth jar from Nahal Tsafit.
- 8.13 Sequence of rock art complexes with schematic chronology.
- 8.14 Ibex petroglyphs typical of the Timnian from Har Michia North.
- 9.1 Map of site locations for Chapter 9.
- 9.2 The Camel site.
- 9.3 The Timnian small flake industry.
- 9.4 Site frequencies from the Pre-Pottery Neolithic through Terminal Timnian and the Middle and Late Bronze Ages, as derived from Archaeological Survey of Israel maps of the Central Negev.
- 9.5 Goods moving in and out of Middle and Late Timnian sites.
- 9.6 Nahal Ramon 160 sandstone milling stone quarry site in the Makhtesh Ramon.
- 9.7 Typical excavated compound from Ein Ziq.
- 10.1 The Near East with areas and sites mentioned in chapter.
- 10.2 The Negev and surrounding areas with sites mentioned in chapter.
- 10.3 1. General view of Iron Age hill fort at Nahal Akrav after excavation, 2. Casemate walls of hill fort at Nahal Akrav after excavation, showing topographical location on top of steep hill, 3. Reconstructed Iron Age Nizzana Cistern (after rain) in the Central Negev, draining off Nahal Nizzana (now known as the Hemed Cistern).
- 10.4 Nabatean settlement distributions.
- 10.5 Nabatean ceramic class frequencies.
- 10.6 Nabatean nomadic sites.
- 10.7 Ein Saharonim caravanserai.
- 10.8 Google Earth photograph of Avdat with pens on eastern periphery.

- 10.9 Site plans from Classical Period nomadic sites from Archaeological Survey of Israel Map 204.
- 10.10 Site Plans, Nahal Oded and Har Oded.
- 10.11 Large (public?) structures from Nahal Oded.
- 11.1 Recent Bedouin tent camp, near the Nabatean site of Givot Reved, in the *Makhtesh* Ramon.
- 11.2 Map of sites mentioned in chapter.
- 11.3 Bedouin storage bins in rock shelter near the Makhtesh Ramon.
- 11.4 Ancient agricultural terraces near the *Makhtesh* Ramon showing Bedouin repair in the uppermost course.
- 11.5 The unrecognized village of Abu Afash, on the main highway (40), south of Beersheva.

Acknowledgments

I began this study while a fellow at the Cotsen Institute of Archaeology at UCLA, on a sabbatical from Ben-Gurion University in 1999–2000; in the event I felt more fieldwork and more analysis were needed and I put the synthesis aside, completing it only while on sabbatical at the Department of Anthropology at the University of Texas at Austin in 2015. My years as an honorary professor at the Institute of Archaeology at University College London and a half sabbatical at the Department of Anthropology at the University of California at San Diego broadened my knowledge and experience and I am grateful to my colleagues and friends in all those institutions: Guillermo Algaze, Liz Carter, Alan Covey, Andy Garrard, Tom Levy, Louise Martin, Rich Macphail, Chip Stanish, Willeke Wendrich, and Karen Wright, who discussed many aspects of this work with me and were always so open with their knowledge and ideas. Karl W. Butzer, may his memory be blessed, also stimulated my thinking. My good friends and colleagues from Israel, Yoav Avni, Noa Avni, Ofer-Bar-Yosef, Danny Bar-Yosef Mayer, Peter Fabian, Isaac Gilead, Haim Goldfus, Avi Gopher, Nigel Goring-Morris, Mayer Gruber, Liora K. Horwitz, Serge-Yan Landau, Gunnar Lehmann, Haim Marantz, Ofer Marder, Avinoam Meir, Yosef Plakht, and Yuval Yekutieli, have offered feedback and encouragement on different aspects of this work over the past years. I owe a special debt of gratitude to my friends and colleagues from the Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences, who initiated the Negev Holocene Ecology Project and opened my eyes to the importance of rock shelters in the Negev; I thank Arkady Savinetsky, Nina Kisseleva, Bulat Khassanov, and Anna Babenki. My friend and one-time publisher, Mitch Allen, has always improved my work. Hans Barnard and Benjamin Saidel, both once doctoral students of mine, were kind enough to read an earlier draft of the manuscript and make important comments. My more recent doctoral students, Dr. Ariel Meraiot taught me invaluable lessons about recent Bedouin history, and Dr. Davida Degen-Eisenberg taught me everything I might know about rock art in the Negev. Arlene Rosen has continuously provided support, knowledge, and encouragement. Patrice Kaminsky and Helena Sokolskaya of Ben-Gurion University helped as always with the illustrations and graphics. Yvgeny

Ostrovsky and Alter Fogel, also of Ben-Gurion University, photographed some of the artifacts. Research over the years has been supported by grants from the Wenner Gren Foundation for Anthropological Research, the National Geographic Society, the Israel Science Foundation (especially # 258/10), the Israel Ministry of Science, and Ben-Gurion University of the Negev. I will ever be grateful to all those students, both my own and those who worked on my excavations as volunteers, for their constant hard work and enthusiasm; I hope that they have felt that their experiences have been worth their efforts.

As always, my wife Arlene, and my children, Yaniv and Boaz, were my true inspirations.

Steve Rosen
December 2015

Beyond History

The Importance of an Archaeology of Pastoral Nomadism

An Introductory Mythology

Nomads in the Near East are the stuff of myth. The nomadic horde sweeping out of the desert, plundering and pillaging the hapless village and laying siege to the city has long been a theme of Near Eastern history, both ancient and modern, from the Amorites as eaters of raw flesh to Lawrence of Arabia. These myths have provided a convenient *deus ex machina* for naive historical explanation. The collapse of states, and indeed civilizations, and the rise of new ones have been ascribed countless times to nomadic invasions; the rise of true religions has been attributed to nomadic desert tribes.

In fact, the myth of the “struggle between the desert and the sown” can be traced far beyond the confines of the Near East. Lattimore’s (e.g., 1962) studies of ancient Chinese history are built on a similar conception of fundamental conflict between heartland China and the Asian steppe. In North Africa, the tensions between the Saracens and the Romans have been couched in similar language (Shaw 1982). Even the Pueblo-Plains Indians hostilities have been interpreted in much the same framework, and are also far more complex than the stereotypes would have it (Cordell and McBrinn 2012:297–299).

The origins of these myths are ancient, antedating by millennia the accounts of the likes of Burkhardt and Burton. They can be traced easily back to classical times when Greek and Roman historians and travelers described (or repeated descriptions of) peripheral tribal groups like the Nabateans (e.g., Diodorus Siculus XIX, 94; Politis 2007), the Scythians (Herodotus Histories IV), the Blemmys (Strabo 17.1; Burstein 2008; Dijkstra 2012), or the Saracens (Mayerson 1994) stereotypically, and usually in rather hostile terms. Earlier than this, in the 2nd millennium BCE, the Babylonians and others reviled the purportedly nomadic Amorites, referring to them as “eaters of raw meat”

(Chiera 1934:58, 112), and in the Bible, the conflict between Cain and Abel is commonly interpreted as that between herder and farmer (e.g., Gaster 1969:53–55).

The origins of these myths are also complex, undoubtedly deriving from a combination of factors, including the difficulties in state control over nomads within its realm (e.g., problems of taxation, census, mineral or water rights, rights of passage, grazing rights), conflicts between the state or empire and tribal groups beyond the borders of the regime (or within them), economic competition between farmer and herder over arable grazing lands (shades of Rogers and Hammerstein's *Oklahoma!*), and general human tendencies to fear “the other.”

The general contrast between state literacy and nomadic illiteracy further underscores the power and the perspective of the state in the construction and control of these myths. This is not only a question of who writes the histories which serve as our source texts (with all the issues of bias and perspective that are inherent in this issue), but how these are disseminated, and how accessible they may become. The state is active in promoting its narrative myths, not merely passive in their writing. These “objective” reasons behind the construction of the myths combine with state control over the production and propagation of information and the political role of that information in maintaining state authority; historians are left with the task of trying to understand both the history and historiography of these myths with few balancing texts from the nomad side.

From another perspective, if perhaps elements of the conflicts and contrasts are not myth, for certainly there really were conflicts between tribal groups and the state, and there really were disputes over lands and rights, in the recounting or constructing of the myth, crucial components of nomadic history and society seem to drop out of the telling. These include the trade and goods exchanged, the services provided both sedentary to nomad and vice versa, the collaborations, the partnerships, the client and patron relationships, the efficiency of the use of otherwise non-productive lands, the constant passage of individuals between sedentary and nomadic, the pervasive kinship links, and indeed often the very blurring of the distinction between sedentary and nomadic, between tribe and state, between private and corporate ownership of land, and indeed at the level of personal identities. Thus, in the reduction to myth, the characterization of the other becomes caricature, losing all complexity, nuance, and richness.

With the rise of critical history and anthropology, fundamental problems in the naive acceptance of the myths of the desert and sown have been demonstrated repeatedly. Anthropology in the late 20th century established the complexity of relations, not only between the nomad and the settled, but

within nomadic society itself. In detailed and relatively long-term studies of pastoral nomadic societies, not only has ethnography contradicted many of the popular external myths about nomads, but it has questioned the nomads' notions about their own cultures and societies. Similarly, more critical perspectives on the texts, both ancient and modern, have disputed their objectivity and historicity. Of course, the very idea of objectivity is itself suspect. Thus, it is not that the myths are "wrong", but rather that they must be understood in the contexts of their specific cultural and historical circumstances. It is those circumstances which are the subjects of more critical anthropological and historical inquiry. Needless to say, our own modes of explanation must also be understood within the contexts of Western culture, but this is a subject beyond the scope of this book.

The Role of Archaeology

If the general conception of nomads and nomadism is molded by myth, then so are conceptions of how archaeology can address the issue. In contrast to its sister disciplines of social anthropology and history, archaeology—and Near Eastern archaeology in particular—has seemingly been slower to adjust to new paradigms on nomadic societies, and this is partially based on the myth that mobile societies do not leave remains that can be studied by archaeology. The reasons for this seem to derive from the structure of the discipline. If on the one hand, nomadic societies (and the intent is those tribal groups based on herding, not hunting-gathering) date primarily to the historic periods, the nature of their archaeological remains can be characterized as "Paleolithic", or at best, perhaps "Neolithic". Researchers of the Paleolithic and Neolithic periods in the Near East, whose field and analytic methods are the most appropriate for studying the "scrappy" remains of historic and proto-historic nomads, have rarely ventured into the later periods. Later period archaeologists, accustomed to excavating the cities, towns and villages of historic and proto-historic times, often have difficulty seeing even the potentials in the excavations of encampments, or small campsites. Thus, such luminaries as Albright (1949:82–83) and Kenyon (1964 [1980]:204–206) have questioned whether archaeology is capable of researching putative biblical nomads, and by extension, nomads in general. Finkelstein and Perevoletsky (1990:68) have claimed "groups that practice subsistence economy based on hunting-gathering or on animal husbandry—and migrate in search of food, water, and good pasture—do not leave traceable remains," leaving one to

wonder how they missed the entire discipline of Paleolithic archaeology.

A second aspect here is, of course, the role of the texts. In the study of recent times, archaeology serves to offer important insights and critique of text-based history. However, both narrative and analytic history are written and determined from the texts. This is not to denigrate the role of historical archaeology,¹ but texts are the basis of understanding the First World War (for example), and to deny their primacy is delusory. On the other hand, without a doubt, there are modern histories whose texts are so lacking that any history based exclusively on them would be not only be incomplete, but probably fundamentally wrong. Thus, histories of colonized or enslaved peoples, often known textually only from the records of the colonizers, demand archaeological research to offset the inherent prejudices in the written records. Archaeology offers a voice not available from the texts. It is notable here that oral histories, even when recorded long after the fact, are also crucial (e.g., for the Negev, Bailey 1980; for a general example from the New World, Trimble et al. 2008). For ancient times, the problems of the texts are compounded (e.g., for ancient Egypt, Burstein 2008). For non-literate peoples, like virtually all nomads in historic times, archaeology offers the only tool which might complement the few textual references available.

However, beyond the problems of the texts themselves, in ancient history, and in the history of biblical lands, the texts exert an even greater power (cf. Smail 2007). The structure of historical enquiry has been dictated by the narratives derived from the texts, whether Gibbon's *Decline and Fall*, based exclusively on classical textual accounts, or biblical histories, based on the Holy Writ. If archaeology today often disputes the biblical narrative (e.g., Silberman and Finkelstein 2002), the text still serves as the referent, the starting point. A tribal group, a place, and event, or a process not named in the Bible does not exist historically, whether they existed in reality or not. This is all more the case for peoples and groups living beyond the horizon of literate societies.

Thus, as the only discipline with the tools to investigate small-scale, non-literate societies, and to offer non-sedentary perspectives and data on historical period mobile societies, the potentials for archaeology to vastly expand our understanding of mobile pastoralism are tremendous. Notably, these potentials offer both deeper time perspectives, as well as greater geographic range. In both of these, archaeology has the potential to greatly increase the range of variability we see in the societies we classify as pastoral nomadic.

Archaeology as a discipline (as opposed to history based on the interpretation of ancient texts) operates on two levels when researching nomads: the indirect and the direct. The direct approach to the archaeology of nomadic societies comprises the investigation of the features part and parcel of

nomadic lifeways, campsites, ephemeral camps, cemeteries, and of course the material remains recovered from them, and a large range of other features in the nomadic geography such as quarries, hunting blinds, rock shelters, rock art, paths, traps, cisterns, etc. An indirect approach relies on identifying the reflection of nomads in the archaeological record of sedentary societies, how they impacted on societies in the form of trade stations, artifacts, and remains found in sedentary sites but deriving from the mobile sector. Thus Duistermaat and Akkermans (1996) see the presence of nomadic trade in the seals discovered at Neolithic Sabi Abyad in Syria; LaBianca (1990) examined faunal assemblages from Hesban at Jordan and reconstructed patterns of nomadic exploitation; and Porter (2012) analyzed iconography found on sedentary sites in Mesopotamia which she concluded/assumed to reflect nomadic presence. Other possible impacts, such as the construction of desert fortification systems, as on the eastern frontier of the Roman Empire (Parker 1986), or destructions and abandonments of various sites have also been attributed to nomads. Although both the direct and indirect approaches have a long history in archaeological research, in fact, they have often been applied uncritically. To be sure, in the past decades surveys and excavations in the Levantine deserts have begun to offer new perspectives on ancient nomads, and it is precisely in this context that this work falls. Nevertheless, nomads in the Near East have traditionally been seen as effectively leaving few remains, except perhaps tombs (and in many cases, the attribution of those tombs to nomads has been questionable); indirectly, their impact has usually been assumed, for example in destruction layers, rather than demonstrated.

It is perhaps needless to say, but this study will focus on the direct approach to the archaeology of nomads, offering evidence from excavations and surveys reflecting and representing the nomads themselves, from their own sites. The potential contributions fall into three general categories.

First, archaeological data can be and is used to construct narratives and explanations for which no alternative data exist. This is most obviously the case for any prehistoric or non-literate society for which no oral traditions or ethnohistoric accounts are available. In this context, archaeological narratives can also be constructed for times and places where other data do exist, independently of those data, and the two reconstructions compared, or contrasted. Such an approach, of course, implies interdisciplinary critique. The scale of such a critique is of an order higher than that of single disciplinary hypotheses since it implies the possibility of significant methodological re-evaluation.

Second, in providing a new and independent data set, without necessarily setting up an independent narrative, archaeology can critique hypotheses and concepts based on historical accounts and ethnographies, forcing re-evaluation

in light of the new data. Given the problematic nature of many early texts, and the difficulties inherent in and limitations of ethnographic analogy, this by itself is no mean contribution.

Finally, an archaeology of pastoral nomadism offers the opportunity of generating new questions and hypotheses far removed from other realms of evidence. Beyond the construction of narrative sequences, more often than not based on conceptions offered by the structure of textual narratives even in their absence, archaeology may offer data sets allowing detailed analyses of these ancient cultures. If the scholarly treatment of ancient pastoral nomadic societies in the Near East based on texts has tended to focus most greatly on culture history, offering a rather biased view of the role of the nomad in the historical sequence, archaeology offers not only new cultures, but an entire range of questions that can be asked only of the archaeological record. Even acknowledging the limitations of the archaeological record, the mere existence of sites, settlement patterns, millennia-long culture sequences stretching into prehistory, material culture assemblages, and organic remains, invite questions not even hinted at by other realms of evidence. That is, archaeological study potentially offers opportunities to study nomadic architecture, trade patterns, seasonality, subsistence systems, religion, etc., etc. Furthermore, unlike the texts, which are rare and limited, and the ethnography, rapidly disappearing, the archaeological record is still awaiting discovery. Of course, the archaeology too is tragically being destroyed.

The Goals of This Study

The above outline of the role of archaeology vis-à-vis other disciplines and methodologies is not especially original. In recent years numerous scholars have commented on the clash between traditional text-based history and archaeology, or on the potentials of archaeological study beyond the constraints of text-driven research (e.g., for Greece, Cherry 2003; for biblical archaeology, Silberman and Finkelstein 2002; for the Negev, Rosen 2003a). However, with respect to ancient pastoral nomadism and its larger history, it has been traditionally assumed that texts (e.g., Mayerson 1989), with the addition of ethnographic analogy to flesh out the details (cf. Cribb 1991), are the only scholarly recourse, and that with the possible exception of the serendipitous discovery of special treasure laden sites, like kurgans, archaeology is basically ineffective in the study of nomads (Finkelstein and Perevoletsky 1990; also for older references, Albright 1949:82–83; Childe

The general goal of this book is to demonstrate that this myth is fundamentally incorrect, and that in the Near East, archaeology can be an invaluable tool for research on ancient pastoral nomadism. Of course, different contexts will dictate different archaeologies. Thus, Smith (2008) has noted the grave difficulties of recovering African pastoral archaeology; his contexts do not obtain for the Near Eastern deserts. This general goal must, of course, incorporate more specific, detailed goals, and I envisage these on three levels: the theoretical, the methodological, and the substantive.

Theoretically, this study is informed anthropologically most especially by recent (and not so recent) ethnologies stressing, among other issues, the close interrelationships and economic asymmetries of desert-sown relations, *per contra* the myths rhetorically summarized above. Thus, beyond more or less standard (and no less important) ecological- and subsistence-oriented reconstructions, the theoretical intent of much of this study is the placement of ancient pastoral nomadic societies into these anthropological frameworks, again in some contrast to more traditional and perhaps stereotypical perspectives.

This said, on a higher theoretical plane, the archaeology of pastoral nomadism offers long-term historical or evolutionary perspectives unavailable to ethnographers, and problematic for historians delving into a deeper past. It is not just the long culture historical sequence which is of interest, but the development of the modern crystallized pastoral nomadism (cf. Khazanov 1984) which can be critically examined archaeologically. That is, our modern definitions of pastoral nomadism derive from modern ethnography and ethnology, but modern and recent pastoral societies are the culmination of millennia of change and development. Ethnography and ethnology cannot account for the full range of variation of the phenomenon, as they are effectively derived only from modern peoples. There are no fossil peoples, and in much the same way that anthropology long ago rejected the idea that some societies represent archaic or primitive modes or stages in cultural evolution, so we cannot expect that ethnography will offer us all the models for understanding the pastoral adaptations that evolved during the course of the human career. Archaeology provides access, albeit limited by its specific methods and data, both to a greater range of societies, cultures, technologies, and historical circumstances, and to a *longue durée*. It is in such perspectives that the real theoretical value of the archaeological study of pastoral nomadism lies, and these should be the basis of our fundamental understanding of the phenomenon as one which changes significantly over the long term.

Methodologically, the primary theme is the *archaeological* study of pastoral nomadism—notably, the direct study of the remains of their camps,

encampments, their settlement patterns, and their material culture—is more akin to that of hunter-gatherers, rather than to the classic Near Eastern archaeology of great civilizations. However, hunter-gatherer archaeology is almost exclusively prehistoric, controversies over the history of the inhabitants of the Kalahari notwithstanding (e.g., Headland and Reid 1989; Solway and Lee 1990), so that the study, writ large, of ancient nomads cannot be simply a later version of Olduvai. Rather, it must ultimately integrate with the historical record, and in a real sense transcend the methods and practices of narrow disciplines.

Finally, at the substantive level, the examples used to demonstrate an archaeology of pastoral nomadism contribute to our knowledge of the culture history of the Negev and its neighboring areas. Culture history in the early 21st century is not the be-and-end-all of archaeological research, but in spite of the disdain that much of the discipline has for the construction of archaeological sequences, and the description of ancient societies, the organization and presentation of data according to traditional archaeological systematics (cf. Clarke 1978) offers a short hand for presentation and easy access to a wide range of material. It provides grist for a large range of archaeological mills. In this, a culture-historical narrative offers a baseline or reference point against which new ideas can be measured and compared. It is not an end, but a means.

It is important to note what this book is not; it is not a study of animal bone assemblages or faunal archaeology. Zooarchaeology (or archaeo-zoology, etc.) is a crucial data set for the study of pastoral societies, in fact, in some ways a *sine qua non* of this kind of archaeology. However, it is not the only data set, and the focus of this work is the integration of the research on faunal assemblages, the ultimate proof that we are dealing with herding societies, with the rest of the archaeological record. The faunal record tells us about subsistence and exploitation, but ancient societies were comprised of trade systems, religious systems, technologies, architecture, settlement systems, etc., and this holistic view of these societies in their variability and their evolution is the ultimate goal of this study. Furthermore, in the common absence of preserved faunal remains from campsite archaeology, zooarchaeology often provides a backdrop rather than hard data to the interpretation of individual sites and settlement patterns.

This book is organized to roughly follow the goals or themes outlined above. The first two chapters, beyond this introductory chapter, are background to the ideas of domestication and the ideas of pastoral nomadism *sensu lato*, presenting little that is truly new, but offering to the uninitiated a perspective on the variability and complexity inherent in these subjects. Thus, [Chapter 2](#), “The Problem of Domestication”, reviews the idea of animal domestication and

different approaches to what this actually means in terms of how we understand different types of animal exploitation and evolving modes of exploitation. This theme of variability is also the primary motif of [Chapter 3](#), “The Problems of Definition: Variability in Pastoral Adaptations”, a brief review of the immense range of mobile pastoral adaptations and how anthropology has attempted, in the past and the present, to provide general frameworks for both defining and studying the phenomenon. [Chapter 4](#), “Invisibility and Visibility: A Background to the Archaeology of Pastoral Nomadism”, discusses the problems and potentials of archaeological methods as applied to the study of pastoral nomadism, in particular, how specific approaches, frameworks, and methods have affected the history of research, and how the problem can be quite effectively addressed, especially in the Near East. In this we return to some of the myths discussed above.

Having reviewed the background concepts, the next section of the book, in a real way its heart, begins with the geography of the region in [Chapter 5](#), “The Environmental Background to the Rise of Pastoral Nomadism in the Southern Levantine Deserts”, the crucial backdrop to all issues of desert adaptations, including issues of environmental and climatic change, and then proceeds to the detailed chronological account of the rise of desert pastoral adaptations. These begin with the hunter-gatherer background in [Chapter 6](#), “The PPNB Baseline: The Last Hunter-Gatherers in the Desert”, and continue through the evolving herding systems in [chapters 7](#) (“The Earliest Herder-Gatherers: The Adoption of Domesticated Animals in the Desert Periphery”), [8](#) (“Revolution in the Desert: The Timnian Culture Complex and the Implications of Systematic Herding”), and [9](#) (“Another Revolution: The Late Timnian, the Early Bronze Age, and the Rise of Economic Asymmetry”). Together these offer a dynamic view of changing ecological, economic and social adaptations to the deserts of the Southern Levant, with a primary, but not exclusive focus on the Negev, the author’s own area of expertise. [Chapter 10](#), “Text and Relict: An Essay on the Archaeology of Desert Pastoralism in the Historic Periods in the Negev” is a brief essay on the periods following the prehistoric and protohistoric rise of pastoral adaptations in the desert, reviewing the debates on nomads in the historic periods in the region, and combining archaeological with historical data. These periods of the Iron Age and Classical Antiquity could easily be the subject of books unto themselves, and are presented here more by way of completeness rather than a full-fledged analysis, a hint of the great potentials for more in-depth study. The epilogue presents a brief view of the archaeology of the most recent Bedouin in the region, in a real way in the light of modernity, technology, and the expansion of the modern state into the depths of the desert in ways never before achieved, the end of the story of mobile peoples in the deserts of the Near East.

A Note on the Chronological Framework

The chronological span of the periods under study here begins just prior to 8000 BCE, with the Pre-Pottery Neolithic B (PPNB), with the introduction of the first domesticated herd animals (goats) into the Mediterranean Levant and the re-colonization of the Levantine deserts by PPNB hunter-gatherers. This period serves as the backdrop to the rise of pastoral societies, and the Mediterranean zone PPNB as the source culture for the domesticated animals eventually introduced and adopted into the deserts. The archaeology of pastoral societies extends through modern times, most notably in ethno-archaeological studies of recent Bedouin groups, and these too play a role in understanding the long evolution of desert pastoral adaptations.

Table 1.1 General Southern Levantine chronological framework including archaeological periods, radiocarbon chronology, calibrated radiocarbon chronology, and calendric chronology.

<i>Uncalibrated</i>	<i>Uncalibrated</i>	<i>Calendric dates</i>	<i>Period</i>
C14	C14	(or calibrated C14)	
BP	BCE/CE	BCE/CE	
1000 BP	950 CE	1000 CE	Early Islamic Period
1500 BP	450 CE	600 CE	Byzantine Period
2000 BP	50 BCE	0	Roman Period
			Hellenistic Period
2500 BP	550 BCE	650 BCE	Iron Age
3000 BP	1050 BCE	1250 BCE	Late Bronze Age
3500 BP	1550 BCE	1800 BCE	Middle Bronze Age
			Intermediate Bronze Age
4000 BP	2050 BCE	2500 BCE	Early Bronze Age
5000 BP	3050 BCE	3750 BCE	Chalcolithic Period
6000 BP	4050 BCE	4850 BCE	Late Pottery Neolithic Period
7000 BP	5050 BCE	6200 BCE	Early Pottery Neolithic
8000 BP	6050 BCE	6700 BCE	Pre-Pottery Neolithic C
9000 BP	7050 BCE	8250 BCE	Pre-Pottery Neolithic B

The general archaeological periodization of this span is presented in [Table](#)

1.1. Although there are clear inconsistencies in the criteria used to construct this framework (e.g., Rosen 1997:13–14), it is standard and nevertheless provides a convenient schematic for organizing the archaeological analyses. Specific chronological, historical, and cultural frameworks will be reviewed in the context of each study. However, several more general issues require comment.

The first is that of dendrochronological calibration of radiocarbon dates. Calibration curves now extend back early enough to incorporate the entire Holocene and thus the entire Neolithic period, and indeed through the Epipaleolithic, prior to the last glacial advance (Reimer et al. 2013). All dates presented here are thus calibrated and/or calendric, and to avoid confusion I have converted all to BCE/CE format. Obviously, the prehistoric dates rely exclusively on radiocarbon chronologies, or other forms of absolute dating, for example, the Uranium series dates of the speleothem sequences (e.g., Bar-Matthews and Ayalon 2011). Later dates, from the historical periods, may rely on calendric dates established by other methods, often modified or adjusted according to radiocarbon critique (e.g., Asscher et al. 2015; Regev et al. 2012). The conversion of all dates to a single format prevents the confusion of a seam between the calibrated and uncalibrated, or between BCE and BP, often the source of unnecessary misunderstanding.

Beyond absolute chronologies, culture and period terminological variations and confusions abound. Different periods and/or cultures may be known by different names in different places; they may have multiple names due to terminological disputes; sometimes the same name is assigned to different chronological spans in different places. The sources of this confusion derive from developmental differences in the archaeology of different regions (even when they may be adjacent), terminological debates based on ideological arguments, and even on real chronological revisions. As is well known, the rationales for dividing periods vary as well, sometimes based on ceramic changes, sometimes other technological changes, sometimes political change or ethnic variability, etc. The terminologies adopted here are presented in [Table 1.1](#), along with the variants. More detailed chronologies are presented when necessary in the appropriate context.

Note

- 1 *Historical archaeology*, especially as a term used in the Americas, refers to the periods either post-dating European colonization of the New World, or to the period of the rise of capitalism (e.g., the *International Journal of Historical Archaeology* defines its mandate as

post-1492). In the Old World, *historical archaeology* more often refers to the periods when archaeology and historical texts are both available for the study of the past. In the Near East, the first writing appears in the 4th millennium BCE, and this period ceases to be the realm of prehistorians, those who study the Neolithic and earlier periods.

The Problem of Domestication

The Range of Domesticates

The idea of domestication, of domestic animals, is implicit in any discussion of pastoral nomadism, mobile pastoralism, etc., and when one looks at modern pastoral societies, or for that matter, modern domestic animals, the issue of what is domesticated and what is not may seem a trivial one. In fact, defining domestication with respect to animals is a complex task; a wide range of behaviors, species and sub-species, processes, and defining attributes come under the rubric “domestic”, including house pets, herded animals, draft and riding animals, fowl, guinea pigs, laboratory animals, carnivores raised for their fur, and even some kinds of “wild” rodents adapted to specifically human environments (e.g., the common house mouse, *Mus musculus domesticus*). All are considered domesticated in one context or another. Patterns of exploitation and associated behaviors range from the development of close and mutual personal ties between animal and human, as in the use of hunting dogs, falconry (leaving aside the question of whether such raptors are indeed domesticated), and house pets, through penned stock-raising as in some types of fowl exploitation and dairying, and on to ranching, where contact between the animals and people may be much more limited. Human behaviors with respect to the animals vary from very active control of breeding, feeding, grooming, and protection to fundamentally *laissez faire* interaction limited to selective culling. Whether all of these should be considered domestication is a moot point since really, the definition of *domestic* is contextual; animals are considered domestic if they contrast in some significant manner (significance is in the eye of the beholder) with their wild progenitors, or their wild cousins—are feral horses or feral cats domestic? The Asian elephant, *Elephas maximus indicus*, was “domesticated” as early as Harrapan times (Sukumar 2003:57–59), but whether these elephants were/are tamed or domestic is very much a question of how one defines domestication, and ties into the particular research questions being addressed. The contrast between wild and domestic may be genetic, or may be a function of human control, not yet (and maybe

never to be) reflected in the genetics. Given the propensity to augment herds with wild animals, as for example practiced by the northern reindeer herders (e.g., Ingold 1980:95; Wallerström 2000), and most especially likely to be evident in the early stages of the domestication process of all prehistoric herd animals, the genetic changes we would expect given human control might be indefinitely postponed. In other cases, as for example the dromedary camel (*Camelus dromedarius*), wild progenitors no longer exist so that genetic comparison is not even possible (and the fossils do not exhibit morphological changes which might allow distinction, although DNA work has not yet been conducted). Furthermore, some types of genetic change which have been assumed to be the result of domestication processes, such as that seen in very early genetic changes in wolves (e.g., Wayne and Ostrander 1999), may be the result of the construction of specialized adaptive niches, the consequence of human presence, but not necessarily human control or even interference (also as above with respect to the domestic mouse).

Lest there be confusion, house pets as a class should not be considered an unusual or modern case since most researchers agree that domestication of many species, including herd species, may well have begun with the individual taming process (e.g., Clutton-Brock 2012:6–7), i.e., as pets, even if they were pets that might ultimately be eaten.

Although most definitions stress deliberate human control over breeding as a necessary condition for domestication (e.g., Clutton-Brock 2012:6; Russell 2002; Zeder 2012 with references), one must be wary of definitions overly influenced by modern efforts to improve breeds and strains through intentional genetic manipulation. Human control or influence at some minimum level is certainly required for any ultimate definition of domestication, but intentional intervention for deliberate improvement of breeds seems likely to be a trait best associated with later stages in the evolution of animal husbandry. It is perhaps natural to assume that the wildest *Bos primigenius* bulls were culled early in order to better manage cattle herds, but on the other hand, killing the healthiest bulls might have had a negative effect on the well-being of the herd. Certainly, the idealization of bulls, well evident at Catal Hoyuk (e.g., Twiss and Russell 2009), in the novels of Ernest Hemingway (as in *The Sun Also Rises*), and the art of Pablo Picasso (in the Minotaur series [e.g., Ries 1972/3]), suggests that culling and selection can be influenced by ideology as well as utilitarian considerations. The fact is that we do not know at what level humans knowingly and actively controlled the breeding of different species in the earliest stages of domestication. The question is especially difficult if there was little in the way of active selection in the earliest experiments in taming and domestication; then the morphological differences between the hunted and the herded would have required even greater time to evolve than if herds were

actively culled for specific features.

In the early stages of domestication some changes in animal morphology and behavior, perhaps most of them, may have been the unintended consequences of herd isolation, protection from predators, or culling of specific animals for goals not related to herd improvement (e.g., Zohary et al. 1998). If the earliest stages of domestication of cattle were fencing and herd control in the contexts of hunting, rather than intentional intervention in the breeding process, then genetic change might have occurred over spans significantly longer than evident in modern times. In the Near East, such “fencing” is evident in the construction of desert kites (e.g., Bar-Oz et al. 2011a, b; Helms and Betts 1987; Meshel 1974; see later discussion in this chapter and in [Chapter 8](#); also [Fig. 8.4](#)), but was apparently used for hunting gazelle, and significantly post-dates, by millennia, the early processes of domestication. However, for example, in the New World, bison drive traps, large wooden constructions resembling desert kites, were built in the Archaic (ca. 8000–2000 BCE) by hunters (e.g., Frison 2004:87; Smith et al. 2008). Ingold (1980:116–117) notes that amongst reindeer hunters, the hunting drive fences developed into corrals for culling and sorting animals. If bison (and for that matter, gazelle) were never domesticated, in spite of the construction of corrals and fences, these behaviors may nevertheless reflect the stages in herd control which immediately pre-date early ranching-style domestication. That these behaviors never developed into domestication may well have to do with the animals, rather than the human behaviors.

The gap between process and morphological change is demonstrably true for goats in the Levantine zoological record, where systematic evidence for morphological change occurs hundreds of years, perhaps a millennium, later than the earliest circumstantial evidence for their domestication (e.g., Horwitz 2003a). Similarly, evidence for systematic exploitation of wool does not occur until several millennia after the putative domestication of sheep (e.g., Levy and Gilead 2012), presumably the result of the selection of only the downy part of the wool coat over the course of millennia.

The issue of self-domestication must also be considered. Thus, narratives of cat domestication stress both the development of anthropogenic environments offering advantages to small cats in the presence of rodents, and the benefits to people in the presence of the cats reducing pests (e.g., Bulliet 2005:89; Clutton-Brock 1981:106–110; Driscoll et al. 2007). In the sense of adaptation to an anthropogenic environment, the case of the cat may be similar to the house mouse, also evolved to adapt to the special environments engendered by human rubbish accumulated in the transition to sedentism (Tchernov 1991). The difference between the two ultimately lay in the development of close human-feline interactions, which did not occur in the human-mouse

relationship. The genetic and behavioral traits associated with domestication (e.g., retention of juvenile behaviors and traits (e.g., Morey 1992; Trut 1999) probably resulted from later stages in the domestication process, after the establishment of behavioral protocols of the close (intimate?) people-animal interactions (Zeder 2012). A similar process can be postulated for dog domestication, given a genetic history of wolves hinting at very early changes in genetic configuration, significantly pre-dating archaeological evidence for close relations between *Canis* and *Homo* (Wayne and Ostrander 1999). That is, if genetic changes with the implication of domestication processes occurred as early as the Middle Paleolithic, the earliest *archaeological* evidence for human-dog interactions (in the Near East) are only seen in the Natufian (Davis and Valla 1978; Dayan 1994). We may speculate that early human hunters created an ecological niche in the accumulation of bones and offal which could be exploited by wolves, engendering behavioral and genetic selection, but which only culminated in domestication proper much later. In this context, it cannot be coincidence that at least in the Near East this seems to have occurred only after humans underwent a significant degree of sedentarization.

The clear distinction between the two processes of herd domestication and self domestication should be clear. It is likely that other processes operated as well, for example, in the domestication of fowl, or guinea pigs.

If direct and active control of breeding is not a necessary condition for domestic status, some form of animal acculturation to the close proximity of people is requisite. This is what differentiates herd following and other specialized hunting practices (as seen for example in the use of desert kites, bison corral hunting, etc.) from domestication. In fact, based on the intensive hunting of gazelle, Legge (1972) and also Cope (1991) have suggested that gazelle were undergoing a process of domestication as early as the Natufian; such practices may well have been precursors to the ultimate control of herds, again stressing the continuum of processes and behaviors that we call domestication, but then again, gazelle and bison were never domesticated. In this context, domestication should not be seen as a yes/no, presence/absence issue, but as one of context and process. In fact, early animal domestication appears to have been a set of processes.

This issue of process(es) is especially crucial when examining the origins and development of domesticate economies, as opposed to biological domestication of the animals. Ethnographic and historic examples of domesticates and domestication are, for all intents and purposes, endpoints, the results of a long evolution of behaviors and selection. The intermediate stages, both genetically and behaviorally (in terms of animal behaviors and the attendant human behaviors), may not be evident among modern animals or societies. Recent modes of domestication and recent forms of pastoralism and

nomadism can provide only partial models for ancient and prehistoric times; recent Bedouin comprise modern societies and cannot be used *a posteriori* and *ad hoc* to model ancient pastoralists.

Identifying Domestication

The identification of animal domesticates in the archaeological record, an obvious prerequisite to studying the development of pastoral nomadic societies, is also complicated. Debates over the domestic or wild status of faunal remains are found all over, as in 8th-6th millennium Saharan cattle (e.g., Smith 1980, 1986; Stock and Gifford-Gonzales 2013), 4th millennium Asian horses (Anthony and Brown 1991; Levine 2005; Warmuth et al. 2012), and *Capra* in the desert PPNB (compare Dean 2014; Russell 1988:158; Tchernov and Bar-Yosef 1982). The most common means for determining domestic status are bone and horn morphologies and assemblage sex and age configurations (e.g., Davis 1987:134–140; Hesse 1982; Payne 1973; Zeder 2006; Zeder et al. 2006). Genetics has only recently begun to have been used (e.g., Warmuth et al. 2012 for cattle; Zeder et al. 2006). Pathologies on animal bones reflecting exploitation, such as teeth wear reflecting bridles, or diseases acquired as a result of domestic contexts, or other effects of exploitation, may also be indicative of domestication (e.g., Crabtree 1993; Marom 2012:182; Siegel 1976; Smith and Horwitz 1984). Other proxies, such as the presence of dung layers (Rosen et al. 2005), spherulites (e.g., Albert and Henry 2004; Brochier et al. 1992; Canti 1997), corrals and other types of site furniture such as troughs (e.g., Effenberger 2012), and material culture trends, such as the appearance of technologies reflecting domesticate animals (e.g., ploughs, bridles [cf. Sherratt 1981]) or the decline in arrowheads over time indicating lesser importance of hunting (Fig. 6.1; e.g., Rosen 1988a), have also been used as indicators of domestication in one form or another. These will be reviewed below, but in fact there are no fixed rules for establishing domestication and different approaches to determining whether faunal assemblages reflect domestication often reflect different implied definitions of the concept.

At the risk of oversimplifying, two general approaches toward domestication can be defined: the zoological and the anthropological. Scholars do not subscribe exclusively to one or the other, but research emphases and methods tend to reflect questions deriving from these two distinct fields. Both of these approaches are based on analysis of faunal remains, but as above, other evidence can also be gathered which may have some bearing on issues of

animal domestication in its broadest sense.

The paleontological or zoological approach has tended to stress the identification of morphological changes in animals as a means of determining domestic or non-domestic status. Size diminution, snout reduction, change in horn shape, coloration changes, the appearance of downy wool, and other genetically controlled features or assemblages of features, are assumed (with qualifications, of course) to reflect selective pressures on closed populations, i.e., human control over herds and their breeding. In other words, these morphological changes are the expression of domestication processes, and represent a point beyond the initiation of the selection process. Domestication is viewed as a variant of Darwinian evolution, natural selection in this case human induced. Darwin, of course, recognized the close relationship between domestic breeds, selection, and biological evolution (Darwin 1859:25–57). In the last decade, increasing numbers of genetic studies have also informed narratives on domestication (Stock and Gifford-Gonzalez 2013; Warmuth et al. 2012; Zeder et al. 2006).

There are three primary theoretical problems associated with the exclusive use of morphological criteria for analysis of domestication processes. The first derives specifically from the fact that phenotypical change, that is morphological change with genetic underpinnings, requires time, and thus, by definition, can only be picked up well after the process has been set in motion. Morphological criteria cannot be used to physically trace the actual origins of the domestication, either in the sense of the first occurrence of selection, or in the first social behaviors which might lie behind that selection. Although the process of morphological change can be considerably accelerated by deliberate selection of breeding pairs, and by insuring the closure of the genetic pool to external input, such behaviors do not necessarily conform to how ancient (or many modern) people managed herds. For example, recent reindeer herders have commonly augmented their herds by luring wild animals into the herd and taming them (Ingold 1980:95; Warmuth et al. 2012 for restocking of wild horses during the domestication process based on DNA studies). Even without adding wild animals, the natural desire to increase herd size and retain a larger breeding population may well come at the expense of strict selection and control over breeding. In short, the morphological expression of domestication is likely to occur considerably later than the first experiments in the process (e.g., Horwitz 2003a; Horwitz and Ducos 2005).

The second problem with a strictly paleontological approach to domestication concerns the assumption that morphological changes in Holocene fauna by and large reflect human intervention and not natural selective pressures resulting from the transition to Holocene environments. This is particularly problematic when examining size reduction as a criterion

for domestication, since Bergman's rule¹ would imply that post-Pleistocene warm periods would favor smaller animals in general. Thus, for example, in North America *Bison antiquus* was replaced by its smaller descendent *Bison bison*, without any interceding process of domestication. This has also been an issue in the determination of the domestic status of early Saharan cattle (Smith 1986). Of course, one could argue that in the Near East the rise of the domestic *Bos taurus*, evolving from *Bos primigenius* (aurochs), and the continued presence of herds of *Bos primigenius* in various places until its final extinction in 17th-century Poland suggest that *B. taurus* diverged from *B. primigenius* as a result of deliberate isolation, in turn implying domestication and not some general trend resulting from environmental change. On the other hand, the fact that later populations of aurochs existed primarily in Europe, as opposed to the warmer climates of the Near East, could also support the idea of a Bergman's rule-type trend toward diminution. Notably, Zeder and Hesse (2000; Zeder 1999) refute the idea of size diminution as a marker of domestication in the goats from Tepe Ganj Dareh.

A similar argument accompanied early discussion of the domestication of the dog (from the wolf) in the Near East (Bate 1937:175–77; Dayan 1994; Zeuner 1958). In general, given the presence of significant environmental changes associated with the end of the Pleistocene and the early Holocene, and the existence of numerous extinctions and evolutionary replacements in this period throughout the world (e.g., Martin and Klein 1984; Stuart 1991), the presence of selective pressures which might affect species morphologies is certainly within the realm of possibility. Ultimately, cattle, goats, sheep, pigs, dogs, cats, etc., were indeed domesticated, and most of these domestic species can be distinguished morphologically from their wild forebears. Thus, if as an alternative to human intervention, natural selection based on environmental change cannot be rejected out of hand in explaining morphological change, the real problem is not in identifying the ultimate products of the domestication process, but in seeing the earliest effects. It is interesting here to note the possibility that domestication was initiated on species/populations already undergoing stress and morphological selection as a result of the Pleistocene-Holocene transition, which perhaps thus served as a facilitating factor.

The final problem with a strictly paleontological approach concerns the presence of domestication without morphological change. Some animals, such as reindeer, elephants, and camels, seem not to show morphological change with domestication. Although it might be argued that the domestication process in these cases is fundamentally incomplete, perhaps simply at too early a stage to express morphological change, to do so would be to miss the point of domestication as *social* process(es), and not merely a biological transformation. In this, the argument resembles that made for plant domestication. The

transition to agriculture is most certainly no longer seen as an episode, but as a long process of both biological and socio-cultural transformation (e.g., Fuller et al. 2010; Rosen and Rivera-Collazo 2012), a hybrid process combining biology and culture, as Russell (2002) puts it. Attempts to view the domestication of plants merely as a Darwinian process akin to the rise of other biological symbiotic systems (Rindos 1984) have been the subject of significant critique (e.g., Rosenberg 1990), most especially because they ignore the role of culture and society as a mediating factor at the historical scales of resolution in which social scientists (archaeologists!) are interested. The same is unquestionably true about the domestication of animals. In fact, in the case of such species as cattle, goats, sheep, and pigs, all of which were domesticated in the early to middle Holocene, and all of which exhibit size diminution, domestication may be in part a result of a coincidence/harmonic between the biological scale of change resulting from the Pleistocene/Holocene transition and the much more rapid historical scale of social change (read human control) which occurred at the same time. Given the fact of Pleistocene-Holocene extinctions, one may speculate that most megafaunas were undergoing stress of greater or lesser degree; domestication may well have offered an especially viable evolutionary pathway given such stresses.

With ever-improving techniques for recovering and reconstructing ancient genes, and for studying modern populations genetically, the role of genetics for analysis of early domestication is ever increasing (see papers in Zeder et al. 2006). In particular, the pictures that emerge from genetic study of modern domestic populations are far more complex than one would have anticipated from morphological study alone. Thus, Naderi et al. (2008) found genetic markers for modern domestic lineages among the wild goats of the Zagros, and argue that these are relicts of very early human involvement in herd management. In Africa, the most recent genetic analyses (Stock and Gifford-Gonzalez 2013) indicate Near Eastern origins for African domestic cattle, but with contributions from indigenous male aurochs. Based on DNA analyses of modern horse populations, Warmuth et al. (2012) conclude that the now extinct *Equus ferus* was domesticated initially in a single hearth, in the western Eurasian steppe, but introgression with wild horses occurred repeatedly over the course of the spread of domestic horses throughout Eurasia. Directly related to the Levantine materials, Kahila Bar-Gal et al. (2002) were able genetically to trace the evolution of domestic goats from wild progenitors at the Neolithic site of Abu Gosh, in Israel, confirming both the chronology of the transition from Pre-Pottery to Pottery Neolithic, and the morphometric analysis. They also noted that the genetics were able to distinguish between *Capra aegagrus* and *Capra ibex*, not yet possible based only on post-cranial morphology. In another study (Kahila Bar-Gal et al. 2003),

genetic analysis revealed bones from the Natufian/PPNA site of Hatoula previously identified as *Ovis aries* (wild sheep) to, in fact, be *Capra aegagrus*.

This idea of animal domestication as a social process leads directly to the anthropological approach to animal domestication. The overlap with the paleontological approach cannot be stressed enough, but instead of looking at domestication as a zoological issue whose primary outcome is in the realm of biological evolution and morphological change, an anthropological approach would tend to view it as an issue of human behavior, specifically as directed at animals. The goal here is to understand the specifics of the human behaviors behind biological transitions. Thus, like other human activities, it should be reflected in the archaeological record, in the faunal assemblages, but not exclusively so. Furthermore, the implications of domestication economies extend well beyond the realm of the animals and their herders themselves, with a large range of social ramifications. Sherratt (1981, 1983) has referred to some of these effects as the secondary products revolution, and the importance of domestic animals beyond subsistence is reflected in trade systems, military applications, communications, energy, and a plethora of other uses which are reflected in the archaeological record of social change. Of course, the adoption of domesticated herd animals into the desert societies effected fundamental transformations in those societies, the focus of this volume.

Beyond bone morphology and genetics, four types of evidence for domestication in the faunal record can be enumerated: 1) the presence of animals later known to have been domesticated beyond their natural habitat distributions, implying import of non-indigenous domestic species, 2) a rapid change in faunal assemblage composition from a wild species to a species later known to be domestic (that is, for example, from gazelle to goats in the Levant), indicating a change in subsistence behavior from hunting to herding, 3) direct contextual associations which suggest strong bonds (read domestication) between people and animals, and 4) the reconstruction of culling patterns reflecting human control beyond hunting.

As with the zoological approach, all such evidence must be read critically. Thus, on one hand the presence of deer on Cyprus (e.g., Davis 2003) is the result of human agency and represents the import of a non-indigenous species; on the other hand, deer were never domesticated in a strict sense, although one can assume that they must have been tamed to some degree. Thus, when goats are found in areas where they were previously rare, as in the southern Levant, the conclusion that they are domestic in a strict sense is perhaps premature; the phenomenon may be similar to that of deer in Cyprus, but in the southern Levant served as the foundation for later development/process. The import of wild or pre-domestic cattle to Cyprus (Vigne et al. 2000) suggests another variant, with deer not undergoing a domestication process, but cattle becoming

either domesticated, or being re-imported as domesticates later on. Of course, one cannot rule out continued import of animals from the mainland. Contrasting with the Cyprus case, in the absence of potential wild progenitors, the recovery of sheep and goat bones in early 6th millennium BCE North African sites is still universally accepted as a sign of their domestic status, and their apparent import from the southern Levant (e.g., Shirai 2009:297–322; Smith 1989; Vermeersch 2012); it is of interest that *wild* sheep were herded/driven into rock shelters in North Africa such that dung layers were deposited (di Lernia 2001); however, these species were never domesticated and thus perhaps served as a behavioral pre-adaptation to herding of later imported domestic species. Similarly, the mere presence of dromedaries beyond the Arabian peninsula in the historic periods is usually taken as evidence of their domestic status (e.g., Grigson 2012; Sapir-Hen and Ben-Yosef 2013; Wapnish 1981).

A parallel critique can be made for a rapid change in faunal composition. Climatic fluctuations are well documented to change vegetation distributions, well demonstrated in pollen diagrams (regardless of the difficulties of chronology). Henry (1989:226–228) has suggested that shifts in the distribution of wild cereals caused by the Younger Dryas served as a stimulus to sedentarization and plant domestication. Such changes may also have affected animal species distributions and patterns of mobility, so that changes in faunal composition must also consider changes in environment as contributing factors. Of course this too may well have served as a trigger for more intensive exploitation leading ultimately to domestication. In this context, it is worth noting the early debates concerning changing faunal frequencies in the Paleolithic in the Levant and the environmental versus social interpretations argued for changing *Dama/Gazella* proportions (Bate 1937; Davis 1982; Hooijer 1961). In that case, the ultimate consensus was that environmental factors were the primary cause behind the transition to gazelle. On the other hand, during the terminal Pleistocene and associated environmental fluctuations, significant megafauna assemblage variability is not evident (cf. Munro 2004; Rosen and Rivera-Collazo 2012); whether this lack of shift is the result of hunting preferences in spite of changing faunal compositions, or whether there really were no changes in wild populations is a moot point. Then again, in the early 8th millennium BCE, during the Holocene climatic optimum, there *was* a shift from gazelle to goat in the southern Levant (e.g., Davis 1982; Garrard et al. 1996; Horwitz et al. 1999; Martin 1999). Regardless, the relatively sudden appearance of goat bones in high frequencies in early-to mid-8th millennium (mid-PPNB) Levant is taken by most scholars to imply the introduction of domestic animals since few wild goats have been recovered from earlier Neolithic or Epipaleolithic faunal assemblages; this is assumed even in the

absence of morphological change (Kahlia Bar-Gal et al. 2002). A key element in the argument was the apparent suddenness of the appearance and the complete reversal in species proportions, from assemblages totally dominated by *Gazella* to those dominated by *Capra*.

Beyond this argument, in a critique of this introduction-replacement-goat-for-gazelle claim for goat domestication in the PPNB, Horwitz (2003a) demonstrates that the introduction of goats and replacement of gazelle were not quite so linear. The faunal assemblage from Pre-Pottery Neolithic B Yiftahel is dominated by gazelle, although contemporary with other goat-dominated assemblages. Horwitz suggests changes in hunting preferences and autochthonous domestication of goats could theoretically account for differences in species frequencies. That is, she claims that few wild goat predecessors have been found in PPNA and early PPNB faunal assemblages, because they were little hunted (as indicated hypothetically above) and not because they were not present in the region. The appearance of goats in the mid-late PPNB may mark a shift in hunting, not the introduction of domesticates, but even this shift nevertheless may be a form of proto-domestication.

This problem of bias in the faunal record of wild, non-exploited species is more complex than appears. One wonders about paleontological assemblages; while researchers generally accept that deer and cattle were indeed transported to Cyprus, there are no non-human accumulated collections for unbiased comparison. Davis et al. (1982) have demonstrated the presence of wild sheep in the Negev in the Harifian culture (10th millennium BCE), where previously the region was thought to be well beyond the natural distribution of the species. We cannot know the real frequency of the species. Similarly, representations of the camel in 3rd- and 4th-millennia Mesopotamia (e.g., Heide 2010) date to well before the earliest bone evidence, and Arabian rock art indicates camel hunting in the period before domestication (Zarins 1978), but we have almost no bone evidence. A similar picture obtains for Egypt, where camels appear in low numbers well before they were actually incorporated systematically into the economy (e.g., Rowley-Conwy 1988; Smith 2000). In short, our assumptions concerning wild populations derive from the archaeological record, a record which is biased by or filtered through human preferences, technologies, and, in general, culture.

Direct contextual associations most certainly indicate interaction between humans and animals, but here too one must be aware of post hoc interpretation. If the burial of dogs with people in the Natufian (Davis and Valla 1978) is taken to suggest a close relationship between the person and the animal, implying domestication, the association between tortoise carapaces (as well other animal remains) with a putative shaman burial at Nahal Hilazon

(Grosman et al. 2008) is not taken to indicate tortoise domestication, undoubtedly because tortoises were never domesticated (at least not in the standard sense of the word). But had wolves not been domesticated into dogs, the evidence of the burials would not stand on its own as evidence of domestication, or even proto-domestication. Similarly, the discovery of goat footprints in bricks at Tepe Ganj Dareh (Hesse 1982) indicates a proximity which would be hard to explain if the animals were hunted, but is truly convincing as evidence of domestication only in the context of the ultimate domestication of goats.

Finally, the reconstruction of culling patterns indicating human control of herds is perhaps the most powerful tool in the battery of analyses. The method was pioneered by Perkins (1964), who claimed that the goats from Zawi Chemi Shanidar reflected controlled and deliberate human culling. In essence, Perkins (correctly) assumed that a herder will selectively cull young males and females beyond reproductive age, retaining in the herd only a few males for breeding, and most females. Thus a bone assemblage from a domestic herd should show a high proportion of young males. Although later study demonstrated that the unusual culling pattern focusing on males was the result of the hunting strategies focused on meat acquisition (Zeder 2008), the model was sufficiently compelling as to serve as one of the primary lines of evidence in Hesse's (1978, 1982) demonstration of goat domestication at Tepe Ganj Dareh and has been used as a mainstay in faunal analyses since then (also Payne 1973). Generally, the analysis of age and sex profiles (along with other analyses, such as body parts) of faunal assemblages offers the potential for distinguishing between different hunting and exploitation practices, seasonality and sedentism, and herding (e.g., Davis 1987:150–151; Hesse and Wapnish 1985:109–120). Payne (1973) proposed three basic patterns of domestic sheep-goat exploitation which would be reflected in different culling patterns for carnivorous pastoralism, dairying, and wool use. Using these models, Greenfield (1988; Arnold and Greenfield 2006) has reconstructed culling patterns to explore the archaeology of dairy and wool exploitation in the Balkans. In general, this method of analyzing the death assemblage has been applied in numerous places in the Old World (e.g., Crabtree et al. 1989).²

Since we assume that animal exploitation is not a random activity and is not dictated by chance encounters, faunal assemblage age-sex profiles can be expected to reflect human economic and cultural decisions. Two primary problems obtain. First, species identification based on bone morphology, especially of post-cranials (e.g., Kahila Bar-Gal et al. 2002, 2003) and the aging and sexing of skeletal remains is no mean task, and in the case of juveniles, may be even more daunting (cf. Zeder and Hesse 2000). Second, even given age-sex identifications, samples sizes are often small, and the relationship

between number of bones and number of animals actually killed must vary considerably from site to site. The problems of such statistics as Minimum Number of Individuals, Number of Identified Specimens, etc. have been discussed in the literature (e.g., Casteel 1977; Marean et al. 2001), and are sensitive to site and locus function, patterns of discard and on-site/off-site butchering/consumption, preservation contexts, and collection methods. For small sites and assemblages, especially campsites, the numbers are never large enough.

Beyond the faunal assemblages, evidence in the general archaeological record also plays a major role in both establishing the presence of domesticates, and more significantly, in assessing the impact of domestication economies on early pastoral and agro-pastoral societies (e.g., Chang and Koster 1986). Site furniture and architecture such as troughs, pens, or barns, if they can be reliably identified as such, are direct indicators of animal husbandry (e.g., Effenberger 2012). The presence of animal dung also reflects the presence of animals, although the identification of dung may not always be straightforward, and different configurations of dung may reflect different types of exploitation (Rosen et al. 2005 compared to di Lernia 2001). Objects such as bridles, bits, harnesses, and plows reflect exploitation of domesticated animals. The presence of ceramic vessels identified as churns (e.g., Amiran 1969:30–34; Rowan and Golden 2009) and the analysis of residues indicating dairy exploitation on ceramics is indicative of dairying, presumably of domestic animals (e.g., Evershed et al. 2008; Sauter et al. 2003). The presence of figurines and iconography depicting herding, riding, traction, pack animals, etc. (e.g., Bulliet 1990; Rowan and Golden 2009; Zarins 1978), also informs on both the presence of domesticates and their roles in society. Of course, even much of this evidence may be ambiguous; iconography may be idealized or mythological, and features and installations may have alternative functions. In fact, like morphological changes, many of these archaeological material expressions of domestication are probably later in the domestication process sequence rather than earlier.

Ultimately and perhaps trivially, discerning domestication in the archaeological record demands multiple lines of converging evidence. The farther back in time we seek to trace the phenomenon, the more difficult, but understanding domestication as process and not event or episode is key to the entire problem.

Herd Animals in the Near East: A Preview to

the Archaeological Sequence

The earliest domesticated herd animal in the southern Levant was the goat, *Capra hircus* (Horwitz et al. 1999), with evidence as early as the Middle Pre-Pottery Neolithic B. Domestic sheep, *Ovis aries*, also seem to have been introduced relatively early, perhaps even accompanying the goat (e.g., Meadow 1989b). Other herd domesticates playing a prime role in subsistence, cattle (*Bos taurus*), pig (*Sus scrofa domesticus*), and camel (*Camelus dromedarius*), were introduced later. Donkeys, primarily pack animals although onagers were clearly hunted, were also introduced only much later. Although cattle and pig are clearly domesticated by Late Neolithic times, perhaps somewhat earlier (Horwitz and Ducos 2005; Peters et al. 1999; Zeder 2011), evidence for domestic camel in the southern Levant is found only in the Late Bronze Age (Wapnish 1981), and in fact, the animal was not integrated into economic systems until the Iron Age (Grigson 2012; Heide 2010; Sapir-Hen and Ben-Yosef 2013). As above, Legge (1972; also Legge and Rowley-Conwy 1987) has also claimed the domestication, or proto-domestication, of the gazelle, as early as Natufian or Pre-Pottery Neolithic times. This claim is based on the sophisticated hunting strategies evident among these cultures, including specific hunting-culling tactics (Dayan and Simberloff 1995; Munro 2004), the apparent specialization in hunting gazelle, and on later evidence for a form of corralling, in the presence of desert kites (e.g., Bar-Oz et al. 2011a, b). There are two problems with these claims. First, behaviorally, the intense territoriality of gazelle suggests that herd control would have been difficult at best (Simmons and Ilany 1975–77). Second, the fact is that gazelle hunting never developed into domestication, so why “proto-domestication” instead of “sophisticated” or “specialized” hunting? The distinction in behavioral *trajectory* is clear and if, on one hand, a comparison between “specialized hunting” and “proto-domestication” is undoubtedly worth making, ultimately the two behaviors do diverge, and the divergence is between hunting and herding.

Other domesticated animals of importance to early pastoral nomadic societies in the southern Levantine deserts include the dog (*Canis familiaris*), the donkey (*Equus asinus*), and the horse (*Equus equus*). The domestication of the dog, from the wolf, occurred in the Natufian (Davis and Valla 1978; Dayan 1994), while evidence for domestic donkey is found only in the Early Bronze Age (Ovadia 1992), in the mid-4th millennium BCE, or less likely, the Chalcolithic period, a millennium earlier (Levy et al. 1991). Grigson (1993) has claimed the possible early domestication of the horse in the Chalcolithic, but the mass of evidence for horse domestication in the Middle East is dated to the 3rd and especially the 2nd millennium BCE, the Middle Bronze Age (e.g.,

Grigson 1993; Olsen 2006). The presence of domestic chicken (*Gallus gallus domesticus*) in the faunal assemblage of the Early Islamic pastoral encampment at Nahal Oded (Horwitz et al. 1997)³ indicates that other domestic animals could also be exploited by desert pastoralists, but chickens cannot be counted as of general importance in the repertoire of domestic animals exploited by the desert pastoralists of the Near East.

Beyond the chronology of when animals were domesticated, it is important to reiterate that domestication, even within a single species, was (and is) a continuing process; the later stages of that process may be as significant as that initial shift to herding. Virtually all the animals domesticated for one function or purpose were later exploited for other purposes which were either added to or replaced the original domestication functions. As reviewed above, secondary products are the most obvious examples of this process, but in addition to the changing patterns in the exploitation of the animals, these shifts in the products exploited had major ramifications for both the pastoralists and the societies to which they were attached. In the Near East, virtually all the animals reviewed above, excepting perhaps dogs and cats (although dogs are most certainly eaten regularly elsewhere), were exploited primarily for meat in the initial stages of their domestication. In the Near East, the transition to secondary products was a long-term process and if characterized by Sherratt (1981, 1983) as a revolution, it was a continuing revolution. Thus, for example, camel exploitation, evolving from hunting and meat exploitation in the 3rd millennium BCE in the Persian Gulf area (e.g., Hoch 1979; Uerpmann and Uerpmann 2002), progressed to transport, and riding, and even later, to systematic military use (Bulliet 1990; Zarins 1992). For modern Bedouin, camels are exploited for a huge range of functions, including milk, meat, wool, transport, riding, racing, and general prestige.

The impact of wool exploitation was so great that it is considered a major component in the rise of early Mesopotamian civilization (e.g., Algaze 2008; Hole 2007; Oates et al. 2007; Porter 2012), and some scholars have cited the exploitation of wool, rather than the domestication of goats and sheep, as the primary impetus to the rise of pastoral societies (Lees and Bates 1974; Sumner 1986). Yet sheep wool was only intensively exploited by the 4th millennium BCE, that is, at least three millennia after initial domestication of sheep. Similar arguments can be made for many of the products of domesticated animals.

Domestication as reviewed above is a hybrid of ongoing biological and cultural change. It operates on different scales and across a range of species. It also operates across different components of human societies in different ways. Thus, the social and historical contexts of domestication are crucial to understand the process, especially when examining a specific component, the

impact of domesticates on desert peoples.

Notes

- 1 Bergman's rule states that there is a positive correlation between body size and colder climate, a result of the increased efficiency in heat retention in larger bodies. Size diminution occurs in warmer climes.
- 2 Castration constitutes another form of culling behavior. In the Andes, morphological differences in bone structure have been used to identify castrated males and are seen as evidence for domestication (Gasco 2014).
- 3 Chickens were also carried historically by the Bakhtiari in the seasonal trek up the Zagros, as seen in the 1925 documentary *Grass* (Cooper and Schoedsack 1925).

The Problems of Definition

Variability in Pastoral Adaptations

Introduction

Like domestication, at first view defining *pastoral nomadism* would seem a straightforward task. Common English usage, deriving directly from the two words *pastoralism* and *nomadism*, suggests that pastoral nomadic societies are those which both herd animals as a primary occupation, and move (seasonally), presumably a necessity demanded by the herding. For example, Cribb (1991:fig. 2.1, 17–20) defined two primary axes of variability for these peoples, one ranging from total sedentism to extreme mobility, and the other from agriculture without domesticated animals, through mixed farming and animal husbandry, and on to pastoralism with no farming at all. In a somewhat similar fashion, Khazanov (1984:17–24) constructed a typology ranging from sedentary farmers with livestock, through various intermediate forms of semi-sedentary farmer-pastoralists, on to “pure” pastoral nomads, who engage in no farming whatsoever, essentially defining the same two variables, the intensity of farming (and its converse, the relative importance of husbandry) and degrees of sedentism. The underlying assumption behind these definitions is that this combination of animal husbandry and annual cyclic migration analytically links all such peoples in some anthropologically meaningful way, and that these two factors, mobility and herds, are the primary interlinked variable(s) in our understanding of the phenomenon. Khazanov, in fact, analytically defines the term *pastoral nomadism* as the form of pastoralism lacking all agriculture, isolating herding as the primary subsistence component in these societies, and mobility implicit in the term.

There is scholarly consensus, even if by default, on these basic notions. Hunter-gatherers are excluded from the rubric (e.g., Cribb 1991:20–22) and Ingold (1980:1–2) suggests that *ownership* of herds constitutes a major contrast, social, economic, and psychological, with earlier hunting modes of animal exploitation. Sedentary farmers are also excluded, although village farming

with a transhumant component is often included in the general spectrum of pastoral behaviors (e.g., Chang and Koster 1986; Khazanov 1984:17–24, 39–67), if not quite pastoral nomadic. However, the difficulty lies in the great variability exhibited between different societies which can and have been labeled “pastoral nomadic” and in the demonstration of common social and cultural modalities arising from pastoral nomadic lifeways which cross-cut this great variability.

These modalities have been defined from different perspectives. Some anthropologists have seen a specific socio-psychological character arising as a result of pastoral nomadic lifeways. Based on his work among the circumpolar reindeer herders, Ingold (1980, 1987) in particular has stressed the qualitative changes in social structures which link directly to and impact on ideology that occurred in the transition from hunting-gathering to pastoralism. Others have identified specific economic relations as a hallmark; Khazanov (1984) has noted the inevitable dependence relations between pure pastoral nomads and sedentary societies; Salz-man (1971, 1972) has stressed the wide range of activities in which pastoral societies engage beyond herding; Black-Michaud (1986) has demonstrated the close relationships between pastoral structures and markets. In addition other researchers have offered specific types of social structures as a common link. Thus, for example, Evans-Pritchard (1940:139–248) and Peters (1960) have stressed the segmentary lineage systems among these groups, as have many later researchers (and see Sigrist 2004 for historical theoretical overview). Sahlins (1961) suggested that these systems are a social adaptation allowing “predation” on other societies. Tapper (1979) suggested that there are biological underpinnings to the hierarchical organization evident in segmentary lineage systems, dictated by cognitive limitations to the size of active social groups. Ecologically and geographically defined structures and trends have also informed some approaches (e.g., Behnke 1980; Carr 1977; Johnson 1969, 1973), sometimes viewing pastoral nomadism as the optimal adaptation to desert and steppe environments, different cultures linked together in general frameworks of ecological optimization (e.g., Forde 1934:94–410; for case studies, 287–370; for review and critique Hjort 1981). Of course, an earlier generation of scholarship (e.g., Trigger 1989:80; also Childe 1951:20–36 for social evolution, 66–70 for rise of pastoralism and cultivation.) saw pastoral nomadism as the social evolutionary link between hunting and farming. In contrast, Sigrist (2004) notes the social evolutionary background to segmentary lineage organization without explicitly tying it to changing subsistence systems.

Few have attempted any long-term historical or developmental analysis, defining the evolution of such modalities, which need not have developed in tandem one with the other. Furthermore, by default the historical assumption

has been that the range of variability evident in modern and sub-modern pastoral nomadic societies exhausts the subject. This, of course, is circular reasoning and one of the classic pitfalls of ethnographic analogy (cf. Ascher 1961; Binford 1967; Wylie 1985) and it is precisely here that archaeology can play such a crucial role. In fact, again by default, approaches to the historical analysis of pastoral nomadism have generally assumed that there is an emergence of the phenomenon as a package with most of its salient characteristics included (e.g., Levy 1983; but see Gilbert 1983 for developmental perspective), that there is either some social evolutionary threshold beyond which pastoral nomadism crystallized as a social system/ecological adaptation/economic framework, etc., or that there is some essence or attribute the acquisition of which defines a society as pastoral nomadic. The complement of this is that once a society has achieved pastoral nomadism, presumably in some ancient time, it no longer develops, but retains those original attributes acquired in prehistoric times (or that further development occurs, but within the parameters of the phenomenon—there is no significant further evolution or development). As with domestication, in fact there was no such threshold event, and there is no specific defining attribute. Pastoral nomadic societies exist in a dynamic flux of historical change and ecological adjustment. An archaeological analysis of early pastoral nomadism is a study of process (Rosen 2008).

The goal here is not to review the variability inherent in pastoral nomadic societies exhaustively or critically, nor to attempt any new ethnological analysis of these societies. Rather the intent is to consider the variability, its influencing factors, and its implications as a background, or as a comparative framework, for the archaeological record. This will place that record in some larger anthropological context. Ideally, once placed in such a context, the archaeological record will provide an historical depth to pastoral nomadism which will, in turn, provide new critiques of an essentially static ethnohistoric and ethnographic present.

Herds, Other Animals, and Their Exploitation

A wide range of animals are herded and exploited by different pastoral nomadic groups, and this variability has a major effect on other elements of pastoral life-ways. Goldschmidt (1979) categorizes flocks/herds into large stock (cattle, camels, reindeer) and small stock (sheep, goats, alpaca, llama), and

associates large stock with generally flat terrain, and small stock with more mountainous terrain. Other domestic animals integral to some pastoral nomadic economies include horses, donkeys, and dogs.

Differences in the stock, of course, determine the size of herds. For example, minimal herd size for basic subsistence among sheep/goat herders is usually estimated at around 40–60 head (e.g., Khazanov 1984:30–33), whereas individual herds amongst the cattle herding Nuer may be as small as 10–15 head (Evans-Pritchard 1940:20). These differences are related both to the major contrasts in the productive potentials of the different herd animals (Russell 1988) and to the nature of the exploitation. The intimate relations evident between the Nuer and their cows contrast significantly with the *laissez faire* ranching of cattle evident in other societies, for example 19th- and early 20th-century western America. Social mores and economics also play a role, so the accumulation of livestock as a means toward achieving wealth may be a primary goal of many herders (e.g., Barth 1961:101; Black-Michaud 1986), whereas others adhere to more egalitarian values which discourage over-accumulation (Evans-Pritchard 1940:20). On the other hand, herd sizes may rise to many thousands, depending on the season, the social organization, and the wealth of the herders. Aggregate herd sizes of the Bakhtiari in the early 20th century during the migration up the Zagros might include more than 100,000 head of sheep (Cooper and Schoedsack 1925).

Maintenance and environmental requirements also differ considerably. This can be seen, for example, especially in the different watering requirements of various animals, camels requiring the least and cattle the most frequent watering. Even within species there may be differences between strains. Barth (1961:6) describes the different types of sheep adapted to different environments of Iran and the compromises in herd composition adopted to optimize production. Naderi et al. (2008) documented the long genetic isolation for variants of domestic goat lineages in the Zagros.

Beyond species differences, Sherratt (1981, 1983) has distinguished between primary and secondary products, the difference essentially being those modes of exploitation requiring killing of the animal (primary) and those which do not (secondary). Such animal products as meat, hide, leather, fur, horns, bones, and tendons are primary products, whereas milk products, wool, hair, blood (“harvested” by African cattle pastoralists [e.g., Evans-Pritchard 1940:21, 26–30]), as well as energy in the form of traction and transport, are secondary products. Russell (1988) has demonstrated the tremendous increase in efficiency when secondary products are the primary mode of exploitation. Payne (1973; also Cribb 1987; Redding 1984) has shown that differing modes of exploitation—meat, dairy, or wool production—will result in different culling patterns in sheep. Market systems may play a major role in the timing and

selection of culls (e.g., Barfield 1981:92; Black-Michaud 1986).

The use of animals for energy requires some greater discussion. Although Sherratt (1981) has stressed the revolutionary nature of the hitching of animals to plows, their use in transport is of greater significance for pastoral nomads (e.g., Ovadia 1992). The use of donkeys, horses, and camels for transport of equipment and personal items, either using wagons as in Central Asia (e.g., Jacobson-Tepfer 2012), or as pack animals in the Near East (Bulliet 1990; Ovadia 1992; Zarins 1992), is a primary factor in the ability to accumulate personal or communal equipment and property. It is difficult to conceive of tent nomadism without pack animals (Rosen and Saidel 2010). Indeed, the accumulation of wealth achieved by Central Asian nomads must be at least partially a function of their ability to transport it during seasonal migrations.

The ability to transport goods also overcomes the bottleneck in the distribution of tribal products, both pastoral and non-pastoral, allowing trade in bulk items, like ceramics and grain, as well as elite goods. Of course, this also has its ramifications for nomads in terms of caravan movement of goods which the nomads themselves did not produce, as in the case of the Nabateans (Hammond 1973; Politis 2007) or the Tuareg (Palmer 1932; Vikør 1982). With respect to the Nabateans, it is not hard to understand the source of Nabatean wealth when one considers the virtual monopoly they maintained over the passage of goods from the tropics, including medicinal herbs, spices, perfumes, incense, and cosmetics, to the markets of the Mediterranean empires and states. To better understand this wealth, for the modern reader it is worth comparing to the equivalent markets and international corporations such as Teva or Bayer, Chanel, and Revlon. For the record, spices in ancient times were, of course, used for the preservation of food and not merely to enhance taste. To get some idea of the importance of incense, not merely restricted to some ancient equivalent of headshops, one need only take a modern Catholic mass using incense and multiply it by all the pagan temples in the Mediterranean Basin during the Classical era.

The ability to ride the animals is no less important (Goldschmidt 1979). In the Near East, the domestication of the camel as a riding animal allowed deeper penetration into the desert, providing refuge from enemies without camels (e.g., Eph'al 1984). The ability to ride horses, and their military application, raised the level of the nomadic threat considerably, although horses were more limited in their uses in the deep desert. The introduction of the north Arabian camel saddle, allowing much greater control of the camel and the enhanced ability to fight camelback, combined the military threat of the mounted raid (Bulliet 1990) with the refuge of the deep desert. Significantly, there are mobile pastoralists without mount animals, for example, pastoralists of East Africa, the Andes, or Finland.

With respect to variability in animal exploitation, the availability of enhancing technologies cannot be ignored. One example is the north Arabian camel saddle noted above, which provided more effective control of the camel (Bulliet 1990). Other examples include the shoulder harness, the bit, the stirrup, the development of controlled breeding, control of the milk fermentation process, and the invention of the wheel. Although not a technological advance, the genetic mutation allowing adult human lactase production clearly enhanced the ability to exploit dairy products among some populations (Curry 2013).

The great variability in herds and their exploitation reviewed briefly above ranges over time and space. Some of this variation can be explained environmentally—what animals are available in and/or adapted to which geographic regions. This perspective is reflected at least partially in regional typologies of pastoral nomadism (e.g., Bacon 1954; Khazanov 1984:40–68). However, much of the variation is not environmentally determined. The spread of domesticates into peripheral zones beyond their natural distribution areas, and the invention, diffusion, and adoption of technologies of exploitation are the results of cultural and historical processes about which generalizations are more difficult to make.

Economy

Although one of the two defining characteristics of pastoral nomadism is a subsistence economy based on herds, the issue of economic base and relations is, in fact, far more complex. Pastoral economies are neither social isolates, nor are they restricted to production based on their animals. There are numerous non-pastoral components which play major roles in these societies.

For Goldschmidt (1979), the relationship to agriculture is one of the four primary factors in examining pastoral nomadic variability. He defines three states: a) little or no use of agricultural products, b) an indirect relationship with agriculture through trade, and c) the secondary practice of agriculture. Khazanov (1984) concurs, placing ultimate emphasis on the degree of agriculture practiced. As mentioned above, he presents a typological spectrum ranging from societies practicing no agriculture at all, to those where part of the population may practice part-time agriculture, on to transhumance, where part of the society practices herding, and on to agricultural societies with elements of pastoralism. For Khazanov, the practice of agriculture in essence dilutes pastoral production so that pastoral nomadism as an analytic

phenomenon must preclude all farming.

The intensity of agricultural production on the part of pastoral nomads is conditioned by a range of factors, both political and ecological. In 19th-century Negev, where Ottoman rule was ineffectual, internecine warfare between Bedouin tribes left agricultural fields at the mercy of any raid (Bailey 1980). Hence, little agriculture was practiced. In contrast, with the strengthening of Turkish rule in the late 19th century, and later with the establishment of more effective Turkish and British control over the region, and the (forced) cessation of tribal warfare, agriculture flourished. Thus, Epstein (1939) and Kirk (1941) present maps showing the southern extent of Bedouin agriculture, extending deep into the central Negev by the 1930s (also Meraiot 2011, 2013). Of course, different regions will support agricultural practices to different degrees, and will require different methods and/or different crops. Rabinowitz (1985) notes that although fruit horticulture is practiced today in South Sinai, it is a 20th-century phenomenon and there is little cereal agriculture. Whereas dry farming of cereal crops was predominant in the northern Negev among the Bedouin in the mid-20th century, prior to the introduction of recent intensive irrigation systems, Bedouin utilized ancient terrace run-off irrigation systems in the Negev Highlands for cereal cultivation (Meraiot 2013). Depending on the intensity of the agriculture among the Bedouin of this region, seasonal migration may take different forms, from near sedentism with shepherd transhumance, to full residential mobility; some of the farming may be conducted by sharecroppers on tribal or privately owned Bedouin land (Ben-David and Orion 1998; Kressel 2003:32–35; Marx 1967:75–76, 91–94; Meraiot 2011). Thus nomadism becomes a social (cultural/political/economic) choice rather than a subsistence necessity. In the southern Negev, agriculture is virtually impossible, although in the 19th and early 20th centuries, Bedouin farmed the special microenvironments of the Uvda Valley (Avner 1990, 1998, 2007). Obviously, movement of tribes into different areas will and did necessitate adjustments in agricultural practices.

Beyond the direct role of farming, the markets of the villages and cities also play a major role in pastoral economy. Beyond mere subsistence, pastoral herds have been sold to cities and towns since early antiquity. The Mari Royal Archives reflect well the integration of state and pastoral economy in the early 2nd millennium BC (Kupper 1957; Luke 1965; Matthews 1978; Rowton 1974, 1977). Black-Michaud (1986) has analyzed the significant effect of market forces on the nomads of Luristan, and Bates (1973) demonstrated the close interrelationship between markets and Yoruk tribesmen in Turkey. And if herd growth is a prime goal in the pastoral economy, and herd size a prime measure of wealth (Barth 1964; Chang and Koster 1994 for studies of pastoralism in capitalist societies), tribesmen nevertheless do not hesitate to convert their

“capital on the hoof” into less speculative modes of investment. Sutter (1987) traces strategies of investment in different types of stock based on risk assessment among the Fulani in Senegal (also Dahl and Hjort 1979). Barth (1961:104), Black-Michaud (1986:133), and Marx (1967:10, 75–77, 99–100) note the prevalence of land ownership as a means of investing capital accrued from herds. With few exceptions, modern and sub-modern nomadic lifeways are and have been integrated into and in many ways dependent on these market systems.

This interconnection between settled society and pastoral nomadic groups extends beyond the exploitation of market systems for pastoral products. Pastoral nomads engage in a wide range of economic activities beyond pastoralism. Such activities as raiding (Sweet 1965), guiding (e.g., Palmer 1872),¹ soldiering (e.g., Hiatt 1989), providing protection (Bakhit 1982:111; Faroqi 1996:54–56; and for ancient times, Mayerson 1994 for the Negev, and Shaw 1982 for North Africa), wage labor (Cole 1975:24, 27, 144; Dahl and Hjort 1979; Rabinowitz 1985), and various cottage industries (Betts 1989; Rabinowitz 1985) have all been incorporated into tribal economies in different places. Hunting and gathering (Salzman 1971) also continue to play secondary roles in pastoral nomadic economies. Caravan trade and pilgrimages often have been the mainstay of Bedouin economics beyond subsistence, as amongst the Tuareg (e.g., Palmer 1932; Vikør 1982), and in ancient times, the Nabateans (e.g., Hammond 1973). Salzman (1971, 1972) has stressed these non-pastoral elements, and implies that multi-resource pastoralism is the rule rather than the exception.

Markets not only provide outlets for pastoral products, but also allow the nomads access to non-tribal goods (e.g., for the Bakhtiari see Rosman and Rubel 1976; for the Lurs, Black-Michaud 1986). These vary considerably, but their importance cannot be underestimated. For those pastoral nomads with limited or no agricultural practices, the markets (or the various personal and tribal connections which may substitute for them) provide the cereals (read calories) necessary for their subsistence. Trade for grain was clearly a major part of 19th-century Bedouin economy in the Negev, Sinai, and southern Jordan, and the trip to the Beersheva and Gaza markets for grain purchase constituted an important part of the seasonal round (Israel 2006; Kirk 1941; Kressel and Ben-David 1995).

Other goods were no less crucial. Pottery used by Negev and Sinai Bedouin were manufactured in Gaza (Israel 2006; Rosen and Goodfriend 1993). During Ottoman times, guns, a crucial part of both hunting and war activities, were purchased in the cities of the Levant (Heyd 1960:79, 80; Saidel 2000; Sharon 1975). Other goods acquired from the settled zone include tea, coffee, sugar, some metal utensils, tobacco and pipes, and jewelry (e.g., Saidel 2008a, 2008b,

2009). Even for those nomads with only the most limited external connections, such as the Masai in Kenya (e.g., Campbell 1984:50), ties to sedentary societies and markets have provided crucial economic buffers during times of drought, or other periods of stress (e.g., Dahl and Hjort 1979 for the Sahel drought of the 1970s).

There are two points to stress here. First, tribal economies are not simply pastoral. They always incorporate a range of activities, sometimes even dwarfing the pastoral component. Second, if not always on a day-to-day level, then on a somewhat higher one, these economies are integrated into the larger systems of the settled zone. Furthermore, the economic asymmetries between desert and sown are self-evident, and pastoral nomads are neither isolated nor independent of their settled cousins (Khazanov 1984; Marx 1992, 2006; Salzman 1971, 1972).

Migrations and Seasonality

Given the variability in herds and economy, it should be no surprise that patterns of migration and seasonality vary considerably between pastoral groups as well. In examining this variability, distinction can be drawn between the causes of seasonal migration, and the factors influencing the patterns of migration.

The search for pasture is usually viewed as the prime motivation for seasonal movement. Cooper and Schoedsack (1925) titled their early documentary about the annual Bakhtiari migration for pasture up the Zagros *Grass: A Nation's Struggle for Survival*. The differential availability of pasture caused by rainfall gradients, altitudinal gradients, or other environmental or climatic contrasts, offers the nomad the opportunity of cyclically exploiting different resources. Thus, the al-Murrah may migrate 400 km in one direction to exploit the seam between the edge of the summer monsoon climate system in the Rub al Khali (the Empty Quarter) in the Arabian Peninsula and the edge of the Mediterranean winter rain systems in North Arabia. The Basseri (Barth 1961) exploited the environmental contrasts resulting from the altitudinal differences between the Zagros Highlands and the Persian Gulf lowlands (also see Cooper and Schoedsack 1925; Howarth and Koff 1976 for film documentaries of similar migrations, as late as the 1970s, among the Bakhtiari, also in Zagros).

Other factors may also affect migration. In central Arabia among the al-Murrah, the seasonal availability of water, both for drinking and to water

flocks, required mobility (Cole 1975:33–36, 39). Seasonal settlement aggregation and dispersal in South Sinai are the result of the availability of permanent water sources during the summer dry season (Kozloff 1981). While flocks can perhaps be foddered in areas seasonally devoid of pasturage, up until the recent introduction of wheeled water tanks (e.g., Ginguld et al. 1997) they could not be foddered in an area without water. Indeed, tribal borders, territories, and resources may be dictated by mutual needs for water (e.g., Behnke 1980:127–132; Meraiot 2011). While winter snow cover (e.g., Barth 1961:3–6) and annual flooding (e.g., Evans-Pritchard 1940:54) may demand migration to new pastures for grazing, each of these is its own reason for migration, without reference to pasturage. For nomads engaged in farming, the need to sow or reap fields requires presence in the fields at specific times. Integration into market systems also requires movement to the market, both for the sale of pastoral products and the purchase of necessary equipment and goods. In the case of the Lurs, the timing of these trips is dictated by the growth of the lambs to the age of slaughter (Black-Michaud 1986:186).

Given the necessity of seasonal migration, reiterating that this is a defining characteristic of pastoral nomadism, there are a myriad of factors which affect the specific shape, timing, and nature of these movements. Johnson (1969, 1978) emphasizes the geographic patterns of the seasonal cycle, defining two primary patterns, vertical and horizontal nomadism (correlating with Goldschmidt's [1979] "terrain"). In addition he defines a set of sub-patterns, including pulsatory, elliptical, constricted oscillatory, and limited amplitude, determined primarily by physical geographic features such as mountain passes, relatively broad "featureless" plains, altitudinal contrasts, etc. Johnson also includes a third primary pattern, complex nomadism, essentially comprised of those groups whose migratory patterns are influenced by factors other than the need to pasture flocks. The patterns are thus more complex, and they are considered exceptional cases. Although Johnson (1969, 1978) implies that complex nomadism is the result of "disturbances" to original systems, his physical geographic reductionism does not consider the complexities of historical or political circumstance (Tapper 1990). There are no "disturbed" contexts, and the patterns he sees as "undisturbed" are reactions to specific historic circumstances no less than his complex nomadism.

In contrast to Johnson's (1969) models of migration, with the emphasis on physical geographic factors, Ingold (1980:5, table 1) has explicitly stressed differential resource distribution. Drawn partially from comparison to hunter-gatherer studies (cf. Binford 1980), he defines two primary migratory patterns, tethered and untethered (Ingold 1987:164–197), referring to seasonal return (or non-return) to a specific site, resource, or feature. Although Ingold's work has focused on northern reindeer pastoralists, and was intended most specifically

to contrast pastoralists with hunter-gatherers, the idea of tethered nomadism can also be applied effectively to desert nomads with scarce water resources (cf. Kozloff 1981), and can be compared to Binford's (1980) logistical mobility. It is also similar to Goring-Morris's (1987:417, fig. XI-1) reconstructions of terminal Pleistocene Natufian and Harifian Sinai/Negev hunter-gatherer nomadism as well as that suggested in general by Haiman (1992b, 1996) for Negev Early Bronze Age pastoralism.

Ecological contrasts, with their varying resources, of course, are one of the determinants in the distance of migrations, which can vary from tens to hundreds of kilometers between different pastoral nomadic groups. The longest yearly migrations achieve distances on the order of 500 to 800 km, as among the Basseri (Barth 1961) and the Ruwala (Johnson 1969:38–46). The shortest distances may be on the order of only a few km, as among some of the Bedouin tribes of South Sinai (Goren-Inbar 1993) or the Galilee (Eloul 2010:20–22, 30–31, 59–60). As per Johnson's (1969, 1978) complex nomadism, although such short migrations may be the consequence of other factors, such as the practice of agriculture, other non-pastoral activities, or social and demographic constraints, they may also reflect resource distribution which does not require long migration.

Variation in resource distribution and availability also demands flexibility in migratory patterns. Cole (1975:35, 39–41) describes the expedient exploitation of short-term grazing opportunities among Arabian camel nomads. The communication of the existence of such pastures, and the inherent flexibility in the migratory patterns, are important aspects in the general seasonal system. Drought years affecting pasturage can also cause extensive adjustments in the seasonal round. Thus, although in the typical year the Bedouin of the northern Negev might migrate some 100 km north, to the Lod area between Tel Aviv and Jerusalem, in drought years migrations would commonly extend another 100 km north, to the Jezreel Valley (Marx 1967:81–85).

Beyond the geographic and ecological determinants of migration patterns, social and economic factors also shape seasonal movements. In his study of the nomads of Cyrenaica, Behnke (1980; also Johnson 1973; Peters 1960, 1965) demonstrates how upland-lowland migration patterns are linked on one hand to differences in resources and subsistence adaptations in different altitudinal/ecological zones, but on the other, to tribal boundaries and lineage connections. Subsistence, and by extension, migration, is as much tied to social links as to optimization of ecological exploitation.

Similarly, in numerous nomadic societies of the Near Eastern deserts, patterns of tribal aggregation and dispersal are tied to ecological factors such as seasonal availability of water (Cole 1975:33–36; Kozloff 1981), geographical bottlenecks (Johnson 1969, 1978), or differential spring growth patterns (Marx

1967:81–91), but also acquire social significance and demand social response well beyond the environmental determinants. Thus, if physical aggregation is at one level environmentally determined, nevertheless, the rituals, celebrations, and social arrangements coinciding with aggregation are the primary factors affecting the character of aggregation. Such issues as camp arrangement, the order of camp dispersal, and priorities in pasturage along migration routes, are determined by internal tribal factors. Such tribal factors can, for example, include wealth, status, size of subgroup, and external connections in the sense of schedules and routes of movements, but not the actual social arrangement of the migration (e.g., Barth 1961:25). Black-Michaud (1986:182–183) describes the virtual absolute power of the headman in fixing the date of departure. The point is that beyond the ecological determinants, social constraints and demands are no less determinant.

The effect of external social and economic factors on migrations is probably even greater than internal factors. Migrations through agricultural lands, as many are, must be negotiated with landowners. Negotiations are conducted by the corporate representative(s) of the tribe (e.g., Barth 1961:76–77). This implies both the influence of the agriculturalists on the passage, as well as that of the pastoral nomadic leadership, i.e., the tribal social structure. Needless to say, passage through farmlands is scheduled so as to avoid destruction of fields, and must occur after harvest and before sowing. Important to note here is that although the animals may graze on field stubble, and indeed may fertilize the fields as they pass through, the scheduling of migrations to avoid destruction of fields is not an ecological optimum, but a social compromise. The corporate structure itself may be in part a response to such external needs and demands, as evident in British involvement with Bedouin tribes in the Negev during the Mandate period (e.g., Marx 1967:10). Eloul (2010:48–50) has described both the facilitating and constraining aspects of the Mandatory administration on Bedouin society in the Galilee. Even in ancient times, as seen in the Mari archives (e.g., Fleming 2009), the state played a major role, through economic co-option, in pastoral society.

Market demands also exert influences on migration patterns. First, the location of markets need not correspond with optimum grazing. Second, perhaps more important, the herder must balance growth patterns, maintenance costs, and consumer demand in determining when to bring animals to market. While young sheep may be smaller and provide less meat for consumption than mature animals, mutton may bring less return per kilogram than lamb. Thus, in such a market system migrations may be timed to maximize return according to growth and age of the animals, and not to pasturage (e.g., Black-Michaud 1986:47–56). Barfield (1981:110–129) notes the tremendous effects of the external markets on the demand for sheep in the

1970s, to the point of eliminating annual migration in some sectors. Fluctuations in market demand may well result in changing patterns of migration. Nomads with fewer ties to markets will be less tied to external consumer demand, and to fluctuations in these markets, and thus their migration patterns less affected. In this, there are clear differences between subsistence nomadism and market nomadism. Market demand may also change pastoral foci. Cole (1975:158–159) notes a shift from camel to sheep/goat pastoralism among the al-Murrah in Arabia, the result of rising demand for meat in the developing urban markets. Of course, it is not clear that in the Near East subsistence nomadism has even existed in recent times (Marx 2006).

Other elements of the integration between nomads and the settled zone may also shape migration patterns. The need to engage in seasonal wage labor may pull some herders away from flocks during certain times, may effect changes in migrations so as to fit the wage labor into the pastoral system or may pull nomads out of the pastoral system altogether (e.g., Cole 1975:154, 158). Other activities, such as raiding or guiding, which may be either opportunistic or seasonal, will also affect the yearly round. The degree of integration with the settled zone will affect these other economic components and hence the yearly round as well.

Summing up this section on pastoral migrations, the great variation evident in seasonal movement among pastoral nomadic groups spans all dimensions of the phenomenon, including distance, scheduling, size and composition of social units in different seasons, and the flexibility/unpredictability of the movement. Although the primary stimulus to movement cannot but be the need to maintain herds and flocks, the contrasts in the patterns of movement derive from a wide range of factors. Both ecological and social, these factors exert pressures directly on pasture systems, and no less significantly, on the whole set of social and economic networks which affect the herds as well as the herders. The character of any particular migration system is the result of compromises between these different factors.

The Structures of Pastoral Nomadic Society

Although the variability reviewed in the preceding sections is evident in the structure of pastoral nomadic societies, several unifying patterns can also be discerned, depending on the scale of analysis. In fact, understanding the organization of these societies requires their examination from at least two levels, that of the tribe, governing decisions of external impact and larger

internal issues, and that of the domestic or household level, involved in day-to-day life. Intermediate levels of structure exist as well, and function at different levels of the hierarchy, sometimes more or less in lieu of the tribe, and other times coordinating activities between households. Tapper (1979) suggests that regularities in group size of these levels reflect basic human behavioral limitations involving the number of people who can actively interact intensively one with another, spatially often masked in larger-scale sedentary societies. Dyson-Hudson and Dyson-Hudson (1980) suggest that these biogenetic factors offer upper limits to numbers within layers of social organization, but that there is great variability beneath those limits. Hassan (1979, 1981:164–175), focusing especially on hunter-gatherers and early agricultural societies, also notes the role of carrying capacity in varying sizes of group units. Finally, Lehmann (2004) suggests upper limits of a few hundred people for early villages, based on the viability of basically endogamous populations.

Beginning with the tribal level, Tapper (1990) notes the tremendous variability in how tribes have been defined, beginning with a demographic range from hundreds of thousands of tribal members to a few thousand, all subsumed under the term *tribe*. Such levels of organization, most likely the consequence of modern state formation (and to a degree, the medieval state) are beyond the scope of this work. At the smaller scale of a few thousand members of a tribe (Tapper 1979), in the *ideology* of many pastoral nomadic peoples (but not all, e.g., the matrilineal Tuareg [Keenan 1977]) tribal affiliations and structure are defined by the patrilineal segmentary lineage (e.g., Barth 1961:49–70; Behnke 1980:93–115; Evans-Pritchard 1940:132–248; Marx 1967:61–80, 181–221; Sahlins 1961, 1968), also sometimes referred to as “conical clan” (e.g., Lindner 1982). This is a set of hierarchically organized patrilineages, linked at each generation by shared ancestors such that at the top all members are linked through a single eponymous progenitor, and at the bottom are all the current members of the tribal unit (e.g., Evans-Pritchard 1940:192–248, figs. pp. 201, 206; Sahlins 1968:25).

These segments (lineages, subgroups, etc.) function on one hand as political decision hierarchies, and on the other, they define intra-and inter-tribal alliance structures for blood feuds and warfare (e.g., Barth 1961:49–70; Evans-Pritchard 1940:143–162; Sahlins 1961). Sahlins (1961) has suggested that this hierarchical structure is an especially effective adaptation for warfare because of its efficiency in establishing automatic alliances and drafting large numbers of warriors. Evans-Pritchard (1940:142–144) has noted the odd contradictions that may arise when two low-level segments are in conflict with one another at one level, but in alliance at some higher level.

From a different perspective, the political segmentation of pastoral nomadic

societies clearly does not accord perfectly with the kinship system. In his study of the Nuer, Evan-Pritchard stresses the difference between the systems:

... a tribal segment is crystallized around a lineage of the dominant clan of the tribe and the smaller the segment the closer the genealogical relationship between members of this clan fragment ...

(Evans-Pritchard 1940:142)

and

Political and lineage groups are not identical, but they have a certain correspondence, and often bear the same name, for a tribal area and its divisions are often called after the clans and lineages which are supposed to have first occupied them. This makes their inter-relation a very difficult problem to investigate and has led to some confusion in writings on the Nuer.

(Evans-Pritchard 1940:194)

This connection to tribal areas and subareas is significant. Most especially based on studies of Bedouin tribes in the Negev and Sinai, Marx (1977) has suggested that tribes are in fact territorial units, and not ultimately kinship based, although the ideology of kinship is maintained. Cribb (1991:52–53), in basic agreement, has emphasized a dynamic view, seeing the tribe as a territorial system, expanding or contracting in different circumstances. The segmentary system provides the flexibility required for what Cribb (1991:44–58) sees as a basic fluidity and instability in pastoral nomadic societies. It is reasonably clear that while kin-based lineage systems provide a theoretical and ideological structure to tribal organization, in reality, at the political level they serve to legitimize expedient measures and circumstances (e.g., Marx 1977). When necessary, kin relations can be found or invented to justify various actions.

Strictly speaking, lineage stratification is in seeming contradiction to the concept of segmentary lineages, fundamentally egalitarian in structure (e.g., Khazanov 1984:144–148), as seen, for example, among the Turkish Yoruk (Bates 1973:133). Nevertheless, numerous pastoral nomadic societies exhibit varying degrees of lineage inequality, as among the Ruwalla (Musil 1928:59–60), the Qashqa'i (Beck 1985:165–169), or the Bedouin tribes of the Negev (Marx 1967:182); The Tuareg had three formal statuses: nobility, vassal, and slave tribes (e.g., Keenan 1977). Salz-man (1999) makes clear that, in fact, pastoral social systems are variable in their degrees of inequality. In this respect, the authority of chiefs also varies considerably, ranging from the level of virtual kingship, as among the Basseri (Barth 1961:71–90) or the central Asian nomads (Broadbridge 2008), to that of the Big Man or Head Man with only powers of

persuasion, as among the camel nomads of Arabia (e.g. Cole 1975:96). Khazanov (1984:148–151), in viewing the tribe as at least partially a political unit as opposed to a territorial entity (and explicitly disagreeing with Marx [1977]), argues that these anti-egalitarian elements of pastoral nomadic society are fundamentally the result of external pressures and requirements. The ability of states to designate tribal leaders to facilitate dealings, resulting in enhanced prestige, wealth, and power for otherwise low-level leaders is well known anthropologically and historically (e.g., Eloul 2010:45–46). It is also attested for ancient tribes, as early as the 2nd millennium BCE in the Mari archives (Matthews 1978:135–142); in some cases, the state and the tribe may be so closely intertwined that tribal leaders are integrated into the function of the state at the highest levels (Fleming 2009; Porter 2004).

If segmentary and tribal structures are in evidence most especially in dealings with external states, and with larger internal conflicts, they are only passively involved at the household level of organization. Although agnatic kinship tends to expression in the composition of camping units, it does not dominate them (e.g., Barth 1961:29–32; Cole 1975:39–53), and camp structure and movement are governed by flexibility. Camping units are first and foremost households which can cooperate with one another and avoid conflict. Notably, this flexibility is usually built into the migratory system anyway, since the seasonal round usually requires aggregation and dispersion. If the tribe is the corporate owner of territory or passage rights, the household is a semi-independent economic unit at the base of the tribe, with varying segmentary levels (clan, sub-lineage, lineage, etc.) operating as intermediaries in the various larger decisions coordinating between the tribe and household.

The Problem of Definition over Time

The great variation reviewed briefly in the preceding sections has, for the most part, been explained as variation over space. Although it incorporates the annual seasonal cycle, the fact of cyclicity itself adds to the snapshot/still-picture aspect of an ethnographic present without real historical depth. Syntheses attempting to elucidate and clarify this variation have focused on static variables such as geography, animal requirements, or short-term economic relations. In spite of the constant emphases on flexibility and fluidity to be found in the anthropological literature, this flexibility is generally perceived as small scale, a short-term phenomenon.

To be sure, Barth (1961:116–121; Marx 1992) recognized a longer term

flexibility in the pastoral nomadic adaptation in the constant shifts back and forth between nomadism and sedentism, and the tendency for the richest and the poorest nomads to settle down. Ingold (1987:193–195) defined *displacement* as long-term territorial shifts in contrast to seasonal migrations, implying that such changes were also part of pastoral nomadic systems, but not offering any systemic perspective. Such shifts are well evident in recent times in the movement of Bedouin tribes like the Haweitat (Murray 1935:271, also maps on pages 247 and 285) or the Ayaydah (Bailey and Shmueli 1977: fig. 1) from North Arabia through the Negev and to the Delta area of Egypt. For ancient times, Adams (1978) has characterized the societies shifting between sedentism and nomadism as “resilient”. Rowton (1977) defined these societies as dimorphic, suggesting that this polarity in mobility patterns is part of the basic structure of ancient Mesopotamian society, paralleling Leach’s (1954) classic study of shifting settlement and subsistence in Highland Burma.

However, even these studies seem to assume a fixed definition or structure for pastoral nomadic societies. Marx (1992) addresses the issue directly, in essence suggesting that variability in “pastoral nomadic” behavior is so great, and so far departs from our classic (or perhaps mythic) ideas of what constitutes pastoral nomadic society, that the concept has lost much of its meaning for the Middle East. The question is similar to the “Are Hunter-Gatherers a Culture Type?” discussed by DeVore et al. (1968).

For Khazanov (1984:148–150), in his critique of Marx’s (1977) conception of the tribe as a territorial adaptation, the problem of variation seems to be at least partially a consequence of the impact of the Western modern world, especially the modern state. As above, Johnson’s (1969, 1978) “complex nomadism” also seems to assume that external relations result somehow in “disturbed” societies. Implicit here is the assumption of some idealized form, or perhaps some essence of pastoral nomadism (Rosen 2008).

Although this issue of external impact has been especially controversial for hunter-gatherer studies, most notably among the hunter-gatherers of the Kalahari (e.g., Headland and Reid 1989; Schrire 1980; Solway and Lee 1990; Wilmsen 1989), it has been less so for the anthropology of pastoral nomads. That is, anthropological research on hunter-gatherers has, in the past, focused to a degree on hunter-gatherer societies as models for the Paleolithic, based partially on an assumption of social and economic isolation.² However, although orientalist and biblicist seeking to illustrate the Holy Writ have often viewed the Bedouin as biblical fossils (Saidel 1998:37–99, 2008a, 2009a), anthropologists working in the Near East have never seen pastoral nomads as cultural isolates. They have been idealized and romanticized perhaps, but always in interaction with larger state societies. If the impact of Western society on pastoral nomadic societies is immeasurably greater than the impact

of earlier states on their tribal contemporaries, there is nevertheless a continuum of differential impact here. That is, restricting the example to the southern Levant, while Israel has affected Bedouin life-ways in the Negev far more than did the British, it is not clear that the British had a greater impact than did the Ottomans. The Ottoman Empire in its heyday exerted a great impact on its peripheral tribes, as did the Romans, as did the Assyrians, etc. These impacts have been varied, including political relations, economic exchanges of various kinds (subsidies, trade, markets, etc.), territorial impacts (expansion and contraction of agricultural zones, borders, trade routes), and technological innovations (camels and accoutrements, guns and other weapons, tools like rotary milling stones, infrastructure like wells and cisterns, etc.). The impact of external societies has always been a prime factor in the character of tribal ones, and, even more importantly, this impact has varied with the historical circumstance.

Thus, social and cultural variation as a result of state relations, incursions, or disturbances must be integral to our understanding of how pastoral nomadic societies operate. Even if one argues that the modern world system has impacted tribal societies on a qualitatively different level than earlier states did (as I will argue in [Chapter 11](#)), it is more difficult to argue that the effects of Rome, or of the Mongols, on desert pastoralist societies were qualitatively greater than those of earlier empires. The issue is not whether today's world system qualitatively differs from that of earlier world systems (cf. Algaze 2005; Hunt 2015), but that each empire and state had major impacts on the adaptations of its nomadic periphery.

This historic dynamic encompasses more than nomad-state relations. Ideological change, as in the rise of Christianity and Islam, effected major variation in pastoral nomadic societies. Saidel (2009a) has argued that the adoption of Islam directly affected the spatial organization of pastoral tents in its gender separation. Technological changes, which are cumulative at least to a degree, have resulted in quantum leaps in pastoral adaptations. The effects of the introduction of pack animals, dairying and the ability to ferment milk, the wheel and harness (and the variations in the harness), the domestication of the camel and later, the invention of the North Arabian saddle, the introduction of guns, and even the introduction of the internal combustion engine, have each changed the face of pastoral nomadism (Rosen 2009). Definitions of pastoral nomadism which do not incorporate this long-term dynamism are missing an element of these cultures as crucial as that of the sedentism-nomadism cycles.

This problem of definition over the long term is especially evident in examining issues of the origins of pastoral nomadism. Beyond the problems of ethno-graphic variability and historical dynamic, explanations and explications of the origins of the phenomenon vary considerably. This

variability stems both from different definitions and approaches to the issue as well as from the variability inherent in the different geographies (including the animals domesticated) and histories of the rise of pastoral nomadic societies.

Beyond the problem of definitional thresholds discussed above, three specific issues obtain. First, although at some level we seem to assume or strive for a kind of unified theory, that one general explanation that fits all pathways to the development of pastoral nomadism, this assumes that pastoral nomadism across the world is a unified phenomenon, an effect whose cause (or system of causes) can be traced in a similar way wherever and whenever. In a real sense, the question is similar to that concerning the origins of agriculture—does one explanation (climate change, cognitive change, genetic evolution, etc.) really suffice to explain the origins of agriculture, or perhaps better, agricultural societies, in all their inherent variability across time and space? Given the well-accepted distinction between in-situ domestication processes and agricultural diffusion, certainly at one level archaeologists have rejected the one-model-fits-all paradigm. Given the complexity of social phenomena, the search for some over-arching explanatory model, *à la* Darwinism for biological evolution (*per contra* Rindos 1984) is quixotic. In *The Blind Watchmaker*, his exposition on Darwinian evolution, Dawkins (1986:1–20) discusses scales of complexity, concluding that biology is more complex than, for example, physics. In fact, the issue is one of epistemology—what scale of explanation is generally deemed satisfying? Between relativity and quantum mechanics, all the issues of the universe can likely be resolved, but this hardly satisfactorily explains the rise of life, cities, or the causes of World War I. Hofstadter (1986:686 ff.) makes the same point in his discussion of the difference between explaining the origins of life, species, and intelligence at biological scales of complexity, and that of the universe, dealing with elementary particles. Archaeologically, Butzer (1982) has made a similar point; our explanations need to be tied to the scale of the phenomena that we are examining (also Rosen and Rosen 2001).

The second problem concerns the assumption that a similar endpoint in social morphology, in this case pastoral nomadism as defined as a presumably meaningful analytic class, demands a similar causal trajectory to achieve that endpoint. Conceptually, this is akin (but not identical!) to the problem of convergent evolution in biology—similar morphologies may solve similar Darwinian problems, but they may be achieved through very different means and paths.³ At one level, the development of pastoral nomadic societies in different areas touches on similar issues such as the efficient utilization of marginal lands, effective exploitation of herd animals, the need for mobility and the exploitation of seasonally available resources, etc. However, such similarities are actually the endpoint, and to assume that they offer

explanation is to adopt a teleological approach to archaeological explanation.

The third problem, directly attached to this, is the assumption that ultimate functions, causes, and structures have meaning for the initial conditions and causes. The initial adoption of herd animals in a periphery may have had little to do with the ultimate maintenance or sustainability of that system. Anticipating later arguments, if the initial adoption of herd animals into the peripheries of the Near East was really a replacement for hunted animals (Chapters 6 – 7), later herding societies in the desert engaged in a much wider spectrum of activities, the use of goats and sheep expanded well beyond replacements for gazelle, and pastoral societies were no longer subsistence based.

This is not to argue for a reversion to some extreme form of Boasian historical or anthropological particularism (though there is much to be said for broad scale and detailed documentation, especially in archaeology). There are themes and motifs shared by many societies classified as pastoral nomadic which offer comparative insights which would otherwise be unavailable. Khazanov's (1984) analysis of nomad-sedentary relations is a seminal example; however, it does not apply universally.

General Notes on Origins

Baselines, Fission, Adoption, and Economics

The starting point for discussion of origins is the baseline adaptation, hunting-gathering, village farming, transhumance, etc., from which pastoral nomadism developed. Given some baseline adaptation, the relevant parameters of the transition to pastoral nomadism must be addressed, that is, what exactly does the transition to pastoral nomadism encompass? In the history of research, these starting points have varied considerably. In the social evolutionary frameworks of the 19th century, pastoral nomadism developed directly out of hunting-gathering, serving as a precursor for agriculture (Childe 1951:20–36; Trigger 1989:80 for social evolution, 66–70 for rise of pastoralism and cultivation). This tripartite scheme was tied directly to the savage-barbarian-civilized trinity based on social Darwinism and (deeply flawed) ethnographic comparisons (Trigger 1989:110–118 for historical overview). Childe (1951:66–70) preserved this cultural sequence in his “oasis theory of the origins of agriculture”, the idea that agriculture arose as people settled around water

sources in the catastrophic transition from Pleistocene to Holocene, with animals domesticated as they were attracted to the water, grew accustomed to, and were fed by people who cultivated cereals in order to feed their newly domesticated animals. Archaeological research on the Neolithic in the Near East, especially that of Braidwood (1967 [1948]:116–177), early on established that herd animals, especially goats and sheep, were domesticated in the contexts of early village societies (also, e.g., Reed 1977). However, the first stages in the rise of pastoral nomadism have been variously attributed to the adoption of these domesticates by hunter-gatherers living in the desert peripheral zones, essentially replacing hunted fauna (e.g., Garrard et al. 1987; Gilbert 1983; Rosen 1988a), or, alternatively, the expansion of Neolithic agro-pastoralists into this zone, with their eventual fissioning into two distinct modes of subsistence: sedentary mixed farming and pastoral nomadism (e.g., Kohler-Rollefson 1992; Rollefson and Köhler-Rollefson 1989; Rollefson et al. 2014). Others have placed the rise of peripheral nomadic societies in the Near East later in history, attached to the rise of complex urban and state-level societies, also essentially positing a process of fission (e.g., Buccellati 2008; Lees and Bates 1974; Sumner 1986).

Working especially on circumpolar reindeer pastoralists, Ingold's (1980, 1987) research has also focused on the transformation of indigenous hunters into herders, as opposed to the fission approach. His thrust has been to explore the social and economic ramifications of this transformation, especially in changes in settlement patterns (the shift to tethered settlement systems) and ideologies of animal ownership, herded versus hunted. In this transformation, Ingold's reconstruction is similar to that which will be detailed in the later chapters here; however, unlike the Near East, where domestication took place among farmers, Ingold (1980) traces a trajectory from hunting through ranching and on to herding, in which hunters, not farmers, were the primary agents of domestication (also Wallerström 2000). Of course, in the Near East goats and sheep, small stock, were the first herd domesticates, and probably more easily accommodated into village life than cattle, domesticated later. The differences serve to illustrate all the more the processual variability in the rise of pastoral societies.

A similar set of alternatives obtains for Africa. There have been debates on the date and nature of cattle domestication and herding in the Sahara in mid-Holocene (Smith 1980), but early arguments for Early Holocene Saharan herding societies have largely been abandoned (Shirai 2009; Stock and Gifford Gonzalez 2013; Vermeersch 2012). Genetic evidence suggests introduction of Near Eastern cattle with later genetic contributions from indigenous African bulls. If connected to the diffusion of other domesticates, goats, sheep, and cereals, this suggests a date around the beginning of the 6th millennium BCE

(Vermeersch 2012). Smith (1986, 1989), reviewing the general issue, indicates the possibilities of cattle domestication by Saharan hunter-gatherers somewhat later, in the 5th or 6th millennium BCE (also Shirai 2009). On the other hand, Sadr (1991) suggests cattle domestication in the context of Nile farming villages, expansion into the savanna, and social fission. Marshall (1990) indicates that East African cattle pastoralism developed out of diversified hunting-gathering and connections with pastoralists from farther north ca. 2000 years ago, significantly later than in Egypt. South African pastoralism, although not the domesticates themselves, also seems to have developed out of hunter-gatherer roots (e.g., Boonzaier et al. 1996:24–27; Smith 2005:151–192).

Marshall's (1990) picture of the origins of East African pastoral nomadism based on archaeology relies on the introduction of domestic cattle, goats, and sheep into the region ca. 2000 BCE. She reconstructs an earlier phase of hunting-herding-gathering, preceding any agriculture, in which the animals were introduced from areas farther north into Late Stone Age cultures. This Pastoral Neolithic essentially continues LSA material culture traditions, but adds herding to the subsistence base. The development of modern bimodal rainfall patterns increased pastoral productivity to the extent that this earlier and more diversified form of herding could evolve into a much more specialized form of pastoralism by 2000 years ago.

Andean camelid pastoralism is based on the alpacas (*Vicugna pacos*) and llamas (*Lama glama*), raised for wool and meat respectively. Llamas were also used for transport of goods in pre-colonial times, although their capacity was significantly more limited than that of donkeys, 30–40 kilograms as opposed to 80 kilograms, and they were to a great extent (although not totally) displaced by donkeys and horses upon their introduction after the Spanish conquests. The wild progenitors, the vicuña (*Vicugna vicugna*) and guanaco (*Lama guanicoe*) (Kadwell et al. 2001; Wheeler 1995), are still extant in the higher altitudes of the Andes, and both were and still are hunted for their meat and fur. Like their camelid cousins in the Near East, the evolution of Andean camelid economies was based on the environmental contrasts between agricultural areas and grazing zones, in the Andean case linked to altitudinal differences, the core zones of pastoralism to be found in the higher and harsher environments. In a study of Andean camelid pastoralism, Flores-Ochoa (1979:117) indicates several possibilities for the rise of this adaptation. Beyond the suggestion that llamas and alpacas were domesticated by pre-Columbian farmers and not hunter-gatherers, he also notes the possibilities that 1) The Spanish invasion displaced farmers into higher altitudes where farming was not possible, and stockraising was the only alternative, or 2) that the ties binding specialized pastoralists to agricultural kin were severed, also a result of the Spanish invasion. On the other hand, although Browman (1974, 1989, 2008)

concur in placing the domestication process in the contexts of sedentary farming societies, he suggests an intermediate stage of hunting facilitation, that is, making the animals more easily available for hunting, essentially a kind of ranching (cf. Rabey 1989). Browman (2008) further notes the development of camelid pastoralism in the Jauja-Huancayo basin well prior to both Inka imperial organization as well as the Spanish conquests. Lane (2006) also notes that Spanish and recent agricultural colonization has displaced earlier agro-pastoral systems, significantly reducing camelid pastoral activities. In earlier periods, camelid pastoralism was economically of much greater importance than evident in the modern historical and ethnographic record.

The transition from these baselines is also defined in different ways, depending to a great extent on what threshold or factors are considered crucial for the essence of pastoral nomadism. For many scholars working in the Near East, these factors revolve around the splitting off, both physical and economic, of pastoral nomads from village farmers (e.g., Buccellati 2008; Lees and Bates 1974; Sumner 1986). The primary defining elements are economic specialization in pastoralism and the exploitation of and habitation in peripheral zones. It is of note that proposed dates of these developments vary widely, from PPNB times (e.g. Hole 1974; Kohler-Rollefson 1992), to PPNC (Betts 2008), Pottery Neolithic (Duistermaat and Akkermans 1996), and up into the Uruk and Early Dynastic periods in the 4th and 3rd millennia BC (e.g., Buccellati 2008; Lees and Bates 1974; Sumner 1986). It is perhaps not surprising that the earlier dates proposed for the rise of pastoral nomadism derive exclusively from prehistorians working on Neolithic sites and survey data, both pastoral and village, whereas the later dates come from archaeologists and anthropologists working in historic periods, either from texts, or from historic period urban and village sites and survey.

The development of pastoral societies in the Eurasian steppe is especially complex given the vast areas and variability encompassed (Frachetti 2012; Khazanov 2003). In the Caspian Sea region, Shishlina et al. (2009; also Kozhin 1997; Morgunova 1995) dates the first pastoral societies to the Eneolithic period, ca. 4300–3800 BCE, when fisher-hunter-gatherer societies first adopted domestic sheep. Succeeding cultures continued to rely on a diversified subsistence economy with a significant component of fish. Penetration of the deep steppe has been difficult to date, but sites from the Late Bronze and Iron Age indicate that at the latest, by the end of the 2nd/beginning of the 1st millennium BCE pastoral cultures were seasonally penetrating deep into the steppe. Khazanov (1984:85–118, 2005), in fact, only dates the beginning of *pastoral nomadism* (in his definition) to the rise of nomadic states, rather than the earlier stages of mobile pastoralism, since it is only in this period, with the development of state-level society, that pastoral societies achieve the

specialization and economic ties to the sedentary zone that define the phenomenon. He also suggests that there must have been a trigger or stimulus for these early pastoralists to give up farming, suggesting climatic change as that single factor which pushed pastoralists to pastoral nomadism (Khazanov 1984:94–95).

Farther west, Frachetti (2012) summarizes the traditional view of diffusion of herding from sedentary agricultural centers north of the Black Sea in the 4th and 3rd millennia BCE. Critically, he also notes that this model of linear diffusion does not consider the multi-regional sources of such aspects of steppe nomadism as wheeled vehicles and horse domestication, as well as regional variability in cultural forms and local environments (also Frachetti 2008).

The development of nomadic states on the steppe (e.g., Khazanov 1984:69–84; Kradin 2002, 2008; Lattimore 1962) has on the one hand deeply influenced historical perceptions of pastoral nomadism, and on the other also poses the unique question of where such states fit in our comprehension of the origins of complex polities in general. Superficially, the greater productivity of the Eurasian steppe would suggest greater demographic potential than that of the Near Eastern deserts. Beyond this, however, archaeological (e.g., Chang 2008; Lightfoot et al. 2014; A. Rosen et al. 2000) and historical (e.g., Di Cosmo 2015; Bemmman and Schmauder 2015) studies indicate that these large scale nomadic tribes/chiefdoms/states in fact had a substantial agricultural base and the dichotomy between the steppe and the settled region was not as marked as assumed. These issues are well beyond the scope of this work, but considering the extra-pastoral subsistence components of the steppe peoples, comparison to other “pastoral” or “nomadic” states (e.g., Nabateans, the Arabs, the Zulu) might offer general insights.

These linked issues of expansion into new territories and group economic specialization are not universal in accounts of the development of pastoral nomadism. As above, for Ingold (1980) studying the northern reindeer herders, the issue is more one of subsistence transformation than economic specialization. Herding replaces hunting in a subsistence economy, and the two features, economic specialization within a larger society, and the colonization of new ecological zones, receive less weight. This idea of subsistence transformation, either in the form of adopting animals domesticated elsewhere, or domesticating them oneself, is also evident in most of the African models (e.g., Boonzaier et al. 1996:24–27; Marshall 1990; Smith 2005), where interplay with agriculturalists and sedentary societies is less emphasized. Among the Navajo, in the American Southwest (Brugge 1983; Kelly 1986; Kluckhohn and Leighton 1962:35–44; Weisiger 2004), domestic sheep were incorporated piecemeal into a hunting-gathering-farming system over the course of hundreds of years. Sheep were acquired initially through

trade and raid and rather early the Navajo achieved skill in woolen textile production (Weisiger 2004); transhumant migrations evolved over the course of the 17th and 18th centuries with the increasing emphasis on stock raising. However, the real transition to intensive and specialized sheep herding did not occur until the mid 19th century, in the contexts of politically forced population transfers and government imposition.

Whereas most of the above scenarios (excepting the late Mesopotamian cases) focus on herding as a mode of subsistence (albeit with external pressures and economic incentives), at one level or another they all require some specific (if varied) social and historical circumstances for the development of herding societies proper. Khazanov (1984) has emphasized these external relations as the *sine qua non* of pastoral nomadism. In fact, virtually all anthropological field studies in the last half-century have demonstrated the complexity, and necessity, of developed social and economic relations between nomad and farmer/urbanite (e.g., Barfield 2003; Bates 1973; Black-Michaud 1986; Chang and Koster 1994; Marx 1992, 2006; Salzman 1971, 1972). Even at the earliest stages, with the possible exception of the northern reindeer herders, the animals adopted by early herding societies derived from donor societies with whom one kind of a relationship or another (kin relations, raiding, fission, exchange, etc.) must have played a role. Thus, the origins and evolution of mobile pastoralism, in particular desert pastoralism, tie to social and historical circumstances; they are not only ecological adaptations.

Issues of Causality

The stimuli, factors, triggers, and mechanisms that have been proposed in one form or another in explanation of the rise of pastoral nomadic societies are no less varied than any of the other aspects of the phenomenon reviewed so far. Like the other aspects, these explanations are tied closely to basic theoretical frameworks and definitions.

The role of environmental change has often been cited as primary, and interestingly, in both the context of climatic or environmental amelioration, as well as deterioration. On the amelioration side, for example, Marshall (1990) suggests that a mid-Holocene wet phase in East Africa afforded the opportunity for pastoralists to expand into grasslands which previously could not be exploited. In essence, the increased productivity of the grasslands as a result of climatic amelioration allowed pastoral nomads to become independent of their mixed farmer-herder predecessors. Pastoral exploitation of the Asian steppe, a defining element in the rise of steppe nomadism, has

also been attributed to climatic amelioration, a pull factor into the rich steppe (Shishlina et al. 2009).

Paradoxically, desiccation has also been suggested as a factor in the expansion of pastoralists into marginal areas. According to this scenario, declining productivity in the Mediterranean zone caused by climatic deterioration resulted in ever more extensive grazing patterns, eventually culminating in the fissioning of the pastoral nomadic from the sedentary communities. Thus Kohler-Rollefson (1992) viewed the deterioration of the landscape as human induced, the consequence of both overgrazing by newly domesticated black goats and the stripping of forests for fuel, especially used in the production of lime plaster. In the subsequent collapse of the Pre-Pottery Neolithic B system, pastoralists were forced to expand beyond the now-scarce agricultural lands, to avoid competition with farmers.

The problems attendant on the use of climatic and environmental change for explaining the rise of pastoral nomadism are both theoretical and methodological in nature. Theoretically, that both amelioration and deterioration have been cited as significant factors in the development of peripheral herding societies suggests that the salient issue is change, not the direction of the change. The herding of animals in marginal zones seems to be an adaptation to more than one kind of environmental stimulus.

Methodologically, it is easy to claim simple correlation between social florescence and collapse and environmental amelioration and deterioration, respectively, but satisfactorily and convincingly defining the causality behind such alleged correlations has been a classic problem in many climate-culture studies (for critique especially A. Rosen 2007; Rosen and Rosen 2001). The reduction of such complex and multivariate systems as climate and society to single-direction vectors of change reflects deeply flawed conceptions of change in both climatology and history/archaeology.

In some cases environmental change may be one of the necessary pre-conditions for the evolution of pastoral nomadism, but it is clearly not a sufficient condition; hypothetically, a climatic amelioration may be necessary to create conditions viable for herding in an otherwise inhospitable environment. Alternatively, climatic deterioration may reduce otherwise agriculturally fertile lands to those which can be used only by pastoralists, as has been posited by Weiss et al. (1993),⁴ although Sallaberger (2007) has argued that it was warring states which made farming untenable, resulting in the reversion to nomadism implied by the 2nd millennium BCE Mesopotamian Mari texts.

Of course, a marginal environment, one which does not lend itself easily to agriculture, is the basic ingredient for the pastoral nomadic adaptation virtually by definition. Needless to say, nomadic groups have often infiltrated

fertile lands; however, pastoral nomadism as reviewed earlier does not develop as a defined phenomenon in such circumstances. Furthermore, depending on the nature of the infiltration and the specifics of the new environment, such groups will soon modify both their patterns of mobility and their subsistence base (cf. Marx 2006).

The presence of domestic or potential domestic herd animals is an obvious necessary condition for the development of herding societies, but neither is it a sufficient condition. Inuit societies and their precursors in northern Canada never domesticated the caribou, in spite of systematic hunting, and in contrast to the Saami, who did.⁵ Additionally, even in the presence of potentially domesticable species, the leap to domestication seems rare. Wild sheep were managed in Neolithic times in Libya (di Lernia 2001), but herding societies did not arise until already domesticated herd animals diffused from the Levant.

Technological factors may facilitate the evolution of pastoral societies. If herd animals were initially domesticated for meat (Hesse 1982; Zeder and Hesse 2000), Russell (1988) demonstrated the marked increase in energetic efficiency once secondary products, especially milk products, were exploited (also Sherratt 1981, 1983).

The development of dairying is not obvious. Although all children are born with the ability to synthesize the lactase which breaks down lactose, a prime component of milk, in the vast majority of human populations that ability is lost as the child matures, and lactose intolerance is the rule among human populations, rather than the exception. The mutation required to enable continued synthesis of lactase into adulthood was rare, and loci of high lactase synthesis (90% prevalence) occur only in northern Europe, western Africa, and the Middle East (Arabia and India). Europe appears to be the first such evolution, coincident with the diffusion of the Neolithic package including cows. Other occurrences, especially in Africa, are also clearly connected to the rise of cattle pastoralism (Gerbault et al. 2013). This genetic evolution did not occur elsewhere, in spite of the greater depth of dairy exploitation, for example, in the Levant or Turkey. Instead, milk products were fermented, to a great extent neutralizing the lactose problematic for Near Eastern and other populations. The development of fermentation technologies, resulting in yogurts and cheeses which can partially neutralize lactose allowing digestion of the milk products by lactose-intolerant people, occurred about two millennia after initial evidence for domestication. In the Near East, ceramics with dairy residues have been dated to the Late Neolithic (Evershed et al. 2008), and Chalcolithic ceramic churns almost undoubtedly reflect dairy processing (Amiran 1969:33–34; Gilead 1988; Kaplan 1954). Skin containers may well have preceded ceramic churns, but dairy residues are not present on the very earliest pottery, so that they probably did not precede them by too

much.

Dairying, of course, is only one component in the set of secondary products (Sherratt 1981, 1983), and other such products also played a role in the evolution of the pastoral nomadic adaptation, if perhaps not directly in its origins. Specifically, the development of downy wool sheep provided one of the bases for the specialized textile production which played a major role in the rise of early complex societies in Mesopotamia (e.g., Algaze 2008:77–87; Porter 2012), and for some scholars, the economic relations necessary for the rise of peripheral pastoral societies (e.g., Lees and Bates 1974; Sumner 1986).

The fleece of wild sheep consists of two distinct kinds of hair: a coarse outer hair providing physical protection from the elements, and a fine inner downy wool, providing insulation. In modern domestic sheep the outer fleece has been replaced by the finer fibers thus retaining only the inner wool, that useable for fine textiles (e.g., Russell 1988:22; Ryder 1983:45–49, 1969). This morphological change in sheep post-dated initial domestication and in the Levant, woolen textiles are not known until the 4th or 3rd millennium BCE, the Early Bronze Age (Levy and Gilead 2012). If pastoral nomadism is tied as a phenomenon to a specific set of settled-nomad relations, then “cash crops” like wool may well be a prerequisite to the development of such systems (cf. Alizadeh 2008; Lees and Bates 1974; Sumner 1986).

The use of animals for transport, traction, and/or riding may also play a role in the rise of mobile pastoralism. In particular, if pastoral nomadism is to be seen as a complex economic adaptation, and not merely a subsistence system, then the ability to transport goods and equipment becomes prerequisite. This ability is tied to both the presence of appropriate domestic animals (usually large stock—ox, horse, camel, donkey, and llama, although relatively small), and the technologies for packing them, harnessing them, or riding them. Thus, various technologies of saddles, harnesses, bridles, packs, and perhaps even wheeled vehicles affected nomadic life-ways. For example, Bulliet (1990) has described the impact of the North Arabian saddle on the ability of desert nomads to fight from camelback. Indeed, the domestication of the camel had considerable impact on nomadic life, allowing greater penetration into the desert due to its ability to go without water (e.g., Gauthier-Pilters and Dagg 1981:10) and greater efficiency in transport. An adult male camel can carry some 200–300 kilograms of goods over long distances in harsh environments with regular rest and watering (Gauthier-Pilters and Dagg 1981:109–111). A donkey can carry 80 kilograms (e.g., Ngendello and Heemskerk 2004), and is considerably more vulnerable to desert conditions. The use of tents and different tent technologies also played a role in the structure of peripheral pastoral societies. Pre-tent societies in the southern Levantine deserts were tethered to physical infrastructures, a kind of constraint on the nature of

seasonal movements. The adoption of tent nomadism, of necessity linked to the domestication of the camel (Rosen and Saidel 2010), removed the constraints of return to a fixed infrastructure of hut base and pen. This is not to say that a group would not return to the site, but that no fixed infrastructure dictated a precise point return. This flexibility allows adjustments in site location for such reasons as social tensions, hygiene, and variation in weather patterns.

Social factors are clearly of considerable importance in the origins and evolution of peripheral pastoral societies. As above, if asymmetric settled-nomad economic relations are considered a fundamental determinant in defining the phenomenon, or at least one phase of it, then the existence of a reasonably complex sedentary society is required before such relations can exist. Such a society must both produce a surplus, and have the means of distributing it such that it supplements the nomadic economy. This need not directly imply a market system since in some cases pastoralists engage individual village go-betweens, with special established relations with members of the tribe (e.g., Barth 1961:98). However, it is not clear if these mediators must, in turn be dependent on a market or proto-market system.

In the case of social fission, the built-in assumption is that the society undergoing the split is complex enough, and its population large enough, to support the economic specialization implied by the rise of an exclusively pastoral branch. Although some fission scenarios envision an external stimulus to the fission process (environmental change, economic competition, demographic pressure), there is often an implicit optimization assumption in such frameworks, that with increasing social and economic development, there is increased economic efficiency. This is provided by pastoral specialization, presumably due to both economies of scale and the exploitation of otherwise-wasted land resources.

Such reasoning can lead to problems of tautology—if fission occurs, then complexity was clearly sufficient. However, other indicators can be used to examine economic or social complexity, such as craft specialization, organization of trade, social hierarchies, and political centralization. Even beyond this, the assumption that economic optimization is a goal, or a cause in itself, is subject to debate, and can be tautological. The controversies over optimal foraging models in hunter-gatherer studies (e.g., Broughton 2002; Byers and Ugan 2005; Smith 1983) are examples of these issues. Optimization is also implicit in some models of ancient herd management (e.g., Cribb 1987; Redding 1984). Without entering into the debates over the application of Darwinian and neo-Darwinian principles to explain the evolution of culture systems (e.g., Barton et al. 1997), such models may indeed provide insights into such general phenomena as the adoption of domesticates into peripheral zones, or specific ecological issues such as resource exploitation priorities. Risk

reduction (Redding 1984) has also been proposed as a major factor in the rise of pastoral societies. As a complement to farming societies, and in the effective exploitation of otherwise marginal lands, pastoral production indeed offers a diversification which reduces risk *as long as strong connections to sedentary societies are maintained*. However, over-specialization in herding intensifies risk; Cribb's (1987) simulation studies of herd growth show that fluctuations in herd sizes are to be expected, presumably as a result of all sorts of variables beyond the control of the herder (environmental perturbations, diseases, etc.). Fluctuations in markets will also affect the ability of the pastoralist to make a living (e.g., Black-Michaud 1986:41, 53).

Population pressure and economic competition also affect the development of pastoral societies. Clearly these are related. Both are "push" variables, tied to fission processes which view the rise of pastoral nomadism as an expansion into territories previously little or unexploited. Specifically, uncontrolled population increase (either of people or, alternatively, of animals) may lead to resource scarcity, ultimately resulting in group fission and colonization of new areas with the concomitant necessity of adopting new or modified economic strategies (e.g., Kohler Rollefson 1992). Binford (1968) suggested a similar mechanism in his explanation of the rise of agriculture. Population pressure is one of the possible variables causing resource competition. However, competition over scarce resources, although in a sense ultimately a demographic issue, can result from factors other than population increase. Lees and Bates (1974) view agricultural intensification and the rise of canal irrigation in support of urban society as the causes of the social fission between pastoralists and farmers. In essence, herders were expelled from ever more valuable agricultural lands (see also Sumner 1986). Kohler-Rollefson (1992; also Quintero et al. 2004; Rollefson et al. 2014) sees pastoral competition with farmers for increasingly scarce arable land around Ain Ghazal as an example of general processes occurring throughout the Levant at the end of the Pre-Pottery Neolithic B.

Summary

"Pastoral nomadism" in its loose sense incorporates great variability in virtually every aspect of the class of peoples in one way or another subsumed under the rubric. A number of authors, most notably Khazanov (1984), have offered classifications which illustrate an ordered spectrum of this variability, usually along specific axes such as nomadism-sedentism, agriculture-

pastoralism (Cribb 1991:17, fig. 2.1), and entity size (Tapper 1979), or offer typologies of the variability, physical geographical (Johnson 1969), regional types (Bacon 1954; Khazanov 1984:40–67), external-internal relations (Rowton 1974, 1977), or type and function of stock (Goldschmidt 1979). As a result, definitions of the phenomenon vary considerably, usually with the analytic focus of the researcher. With variation in the phenomenon itself, and variation in definitions, approaches, accounts, and explanations of origins also vary. For archaeologists, even with the great variability evident, few of these definitions allow for developmental or evolutionary change beyond the variability exhibited ethnographically.

This variability over time is the key to understanding both the phenomenon itself and its origins. If all pastoral nomadic societies share the attributes of herding and mobility, and these attributes may at some level result in shared characteristics, at other levels the variability may be greater than commonalities. Thus, there is no developmental threshold defining the transformation into pastoral nomadism nor some feature or limited set of elemental features, that is, beyond mobility and herd animals, without which a society cannot be fruitfully examined within the general framework of societies that are seen as pastoral nomadic. Furthermore, pastoral nomadism is evolving and dynamic; it is a process, both short term and long term.

Given this background, the role of archaeology for understanding the origins and development of desert pastoralism lies on three planes. At the lowest plane, archaeology offers a new and independent data set for studying variability in pastoral adaptations. At the higher, these data are inherently organized chronologically, so that archaeology can contribute coherent long-term narratives to the rise of the phenomenon. Only after several such sequences are developed, each with its particular explanatory array, can we address the highest level, the evolution of mobile peripheral nomadism, from a more global perspective.

Notes

- 1 Palmer, the English Orientalist seeking to rigorously determine the location of Mt. Sinai and the route of the Exodus, clearly used Bedouin as his primary guides during his travels.
- 2 While the issue of the origins of South African hunter-gatherers is of genuine interest, whether the !Kung and other groups began as pastoralists and degenerated to hunting-gathering does not necessarily imply that ecological or economic models based on their recent hunting-gathering mode of existence are inappropriate for studies of prehistoric hunter-gatherers. Then again, the fact that they are hunter-gatherers does not

automatically mean that they ARE appropriate models for such studies.

- 3 Sound-based sensory location evolved separately in such diverse species as bats and marine mammals. Obviously, both are explained by Darwinian principles, but the contexts are so disparate as to demand very different explanations in the details of the evolution. It is not enough simply to state that they are both based on Darwinism. Similarly, sonar technologies, equivalent in their physical principles to the biological systems, took a very different developmental trajectory; one could argue that people are biological beings and that the development of sonar technologies for submarines at some level is the result of Darwinian evolution. This offers no explanatory satisfaction (cf. Kaplan 1964:358–369 for discussion of explanatory satisfaction).
- 4 The impact of the 4.2k event on Near Eastern society has been much debated. Mercifully, scholarship has moved beyond simplistic climatic determinism (e.g., papers in Kuzucuoglu and Marro 2007).
- 5 The reindeer of the Old World and the caribou of the New World are the same species, *Rangifer tarandus*.

Invisibility and Visibility

A Background to the Archaeology of Pastoral Nomadism

Why We Have Not Seen the Nomads

In his introductory essay to *Perspectives on Nomadism*, Neville Dyson-Hudson (1972) complained about what he saw as a fundamental backwardness in anthropological research on pastoral nomadic societies. In spite of a large first-hand descriptive literature, nomadic studies into the 1950s were dominated by approaches essentially non-anthropological, anthropologically simplistic, or even obsolete. Writing in 1972, Dyson-Hudson viewed the 1950s as a watershed period which saw the first social anthropologists working directly with nomads, and, citing especially the work of Frederik Barth (e.g., 1961, 1969), the 1960s as marking the adoption of anthropological interpretations of that fieldwork. One could make a similar claim with respect to work on hunter-gatherers, beginning with the *Man the Hunter* volume (Lee and Devore 1968), regardless of later critique.

The situation of the archaeology of pastoral nomads in the Near East in the early 21st century parallels that of anthropology four decades earlier. Although as a discipline, archaeology has grappled effectively with the entire scale of human communities and adaptations, from Pleistocene hunter-gatherer bands through the empires of classical antiquity, and has spawned sub-disciplines and specializations dealing with this tremendous range, the *archaeology* of pastoral nomadic societies and peoples has received short shrift (but see e.g., Cribb 1991; Frachetti 2008; Rosen 2011a; and recent collected works, e.g., Barnard and Wendrich 2008; Chang and Koster 1994; Szuchman 2009). Like that earlier stage in anthropology, the archaeologist studying ancient pastoral nomadic societies has received knowledge from other disciplines, primarily ancient history and ethnography, which provided answers adequate for most of the research questions addressed, but work on the actual sites themselves

has been limited. Of course, the focus of much of this research was never truly on pastoral nomadic cultures and societies, but rather on the relations between these societies and their sedentary cousins and their role in history writ large. In the Near East this has been especially evident, for example, in the works of Mayerson (1989a, 1994), looking historically at classical period nomadic groups, with archaeological responses (Avni 1996; Banning 1986; Haiman 1995; Rosen and Avni 1997) and most recently, Porter (2012), examining the role of putative nomads in the rise of the earliest Near Eastern Civilizations (also see papers in Szuchman 2009). Of course, archaeologists have also viewed nomads as prime movers in the decline of civilizations (e.g., Kenyon 1980:145–147), echoing historians (e.g., Sharon 1976). And, as reviewed earlier, nomads have had their place in general culture evolutionary schemes (e.g., Childe 1951), although much of this has been refuted both historically and theoretically (especially Khazanov 1984; and see Gellner's [1984] foreword). In those cases where cultural background on ancient nomads was needed for specific purposes, such as textual analysis, modern ethnography was often used in lieu of archaeology (e.g., Matthews 1978; Robertson-Smith 1927:220ff., 290ff., 450ff.), the perils of analogy notwithstanding. The virtual absence of *archaeological* study of mobile pastoralism as a general research subject (for individual sites were occasionally excavated [e.g., Cohen and Dever 1981; Dever 2014]) prior to the 1980s suggests that there was not even the perception of a need for such research, let alone any recognition of its potentials.

There are two basic reasons underlying this blindness. The first has to do with the structure of archaeological research and the second, fundamental misapprehensions of the nature of pastoral adaptations.

The Structure of the Discipline

Beyond the apparent (but in hindsight, illusory) adequacy of the historical and ethnographic records for archaeological issues, the development of the disciplinary structure of archaeology, with its clear distinction between prehistoric and historic archaeology (classical archaeology, biblical archaeology, historical archaeology, all of them in contrast to prehistoric archaeology) (e.g., Cherry 2003; Rosen 2003a; cf. Glock 1985), has proven a major barrier to the development of an archaeology of mobile pastoralism. The long-term methodological and theoretical divergence between prehistory and history (for Mesoamerican parallel see Coe 1992:271–274) resulted in both a lack of research tools and theory for historical archaeologists who might be

interested in the archaeological study of nomads as attached to a period or historical culture, and a lack of research focus or theoretical framework for prehistorians already involved in Stone Age field and analytic methodologies.

Like archaeology as it is practiced over most of the world, archaeology in the Near East is a discipline with multiple roots. Prehistoric archaeology, Bronze and Iron Age archaeology, and Classical archaeology all derive from distinct scholarly traditions, each one with its own set of methods and own research agenda.

Bronze and Iron Age archaeology in the Near East, and the Levant in particular, originated in the 19th-century explorations of Egypt, Mesopotamia, and Palestine, which culminated in the deciphering of ancient languages, the discovery of spectacular sites and monuments, and the documentation of civilizations known from biblical and early classical texts (e.g., Silberman 1982). Subsequent development, undoubtedly conditioned by the intense public interest generated by the initial discoveries (not to mention the political motivations of the sponsoring states [Abu el-Haj 2001; Feige and Shilony 2008]), continued to focus on the “great civilizations” of the ancient world. Fieldwork and methods followed suit, evolving to fit the needs of a scholarship designed to recover the “high culture” of the grand civilizations of the past. It is no surprise that Bronze and Iron Age archaeology was long dominated by the excavation of fortifications, palaces, and temples, and the analysis of decorated ceramics, cult objects, and metal implements (but see Petrie 1917 for major exceptions). The more mundane elements of the archaeological record, such as food remains, domestic architecture, small sites, stone tools, etc., were simply not recognized as especially relevant to research whose focus was on the cultural achievements of ancient peoples in the early days of the discipline (cf. Mellaart 1975:11–12).

Classical archaeology followed a similar developmental pattern. If anything, archaeology was even more “the handmaiden of history” (Hume 1964; also Mayerson 1989a for archaeology as insignificant microhistory), a supporting actor whose primary role was the physical illustration of the wonders of the Classical past. Biblical archaeology, that is, Bronze and Iron Age archaeology in the Levant, in its inception was also seen as the illustration of biblical history (e.g., Silberman 1982:38–47). The strong relationship between art history and classical archaeology, dating back at least to Winckelman, is characteristic of the emphasis placed on the more elite aspects of ancient societies.

The division between history and prehistory is a fuzzy one, further confused by differences in regional traditions. In the New World, historical archaeology is defined by the arrival of Europeans, that is, prehistory is anything prior to 1492,¹ regardless of the decipherment of ancient Maya. Although technically, of course, history is usually defined by writing, appearing in Mesopotamia

during the 4th-3rd millennia BCE, in practice, important Neolithic sites, lying at the bases of tells, were first excavated by historical period archaeologists, that is, those working on the Bronze and Iron Ages. Thus, the Pre-Pottery Neolithic B horizon at Jericho was first documented by Garstang (e.g., 1932) in the 1930s, and Kenyon's (1957) excavations in the 1950s exposed and defined the Pre-Pottery Neolithic A. Notably, Levantine Neolithic cultures have elaborate and impressive architectural remains. Regardless, even now the prehistorian venturing into post-Chalcolithic horizons is rare, and the historical archaeologist digging a pre-Chalcolithic site even more so.

Unlike the archaeology of the historical periods, the impetus to prehistoric archaeology in the Near East derived from the natural sciences—from Darwin and Lyell, and from early European investigations of the Paleolithic (e.g., Daniel 1975; Trigger 1989:94–102). The earliest scientific explorations and reports on Stone Age sites in the Levant date only to the 1920s (e.g., Buzy 1927; Garrod and Bate 1942; Neuville 1930; Turville-Petre 1927), almost 100 years after the earliest “biblical archaeological” investigations (e.g., Robinson and Smith 1841), and from its inception, both the research agendas and the research methods of prehistoric archaeology were removed from those of the historical periods.

By default, prehistoric archaeology was tied to small sites, especially caves, with little or no architecture, and an abundance of remains from day-to-day activities—stone tools and waste, hearths, and animal bones. Stratigraphy was defined by geological as opposed to cultural or architectural horizons, as in the stratigraphy of Tabun Cave as published by Garrod (Garrod and Bate 1937), and environmental variables indicating changes in climate were of prime importance (e.g., Zeuner 1946). In addition to the explication of the culture-historical sequence, as reconstructed from stone tool industries, research was tied closely to evolutionary frameworks, both biological and cultural, with all the ideological baggage associated with those frameworks (e.g., Trigger 1989:110–147).

The point of this discursion into the development of the structure of the discipline is that since pastoral nomadism is an historical period phenomenon, one traditionally attached to the Bronze and Iron Ages, and the Classical Period, the archaeologists primarily interested in it in terms of archaeological sequence and historical perspective should have been historical archaeologists, in the sense discussed earlier. Yet, Near Eastern historical archaeology, Bronze Age and later, has been both methodologically and theoretically ill-equipped to even recognize the remains of pastoral nomadic peoples, their campsites and their relatively poor material culture assemblages, let alone investigate them in any depth.

Without detailing here the methods of an archaeology of pastoral nomadism

(see next section for discussion), the essence of the argument is that the field and analytic methods so effective for the discovery and interpretation of large-scale communities—villages, cities, and states—are too coarse grained for the smaller scale of nomadic groups. By the same token, of course, uncritical application of the methods of prehistory to the archaeology of complex societies would result in samples too small to have any meaning.

Several examples will suffice to illustrate the point. Aerial and satellite reconnaissance has proven to be one of archaeology's most effective tools for the location of large features over the Near Eastern landscape (e.g., Ur 2003; Pournelle 2007). Yet, aerial photographs cannot reveal ceramic or lithic scatters, hearths, rock shelters used for stabling, or small features such as abandoned tent remains. Saidel (2009b) has successfully used Google Earth to survey extant Bedouin camps, but it is impossible to find them using the satellite images after the tents have been dismantled. Examining Google Earth in the Negev in areas previously surveyed, large sites and agricultural terrace fields are readily evident, but the smaller sites, even those with architecture, are evident only if one knows they are already there. Similarly, large grid excavation (5×5 m and 10×10 m), the Wheeler-Kenyon method, have proven invaluable for the excavation of large sites and tells; for sites which may well fit into a few grid squares, such as lithic or ceramic scatters and many small sites, such methods lack the resolution crucial for characterizing the site and its artifactual contexts (Rosen 2011a:6–10). Large-scale deep stratigraphic sections, documenting major settlement discontinuities on tells, have no parallels in small-scale sites. Similarly, vehicular survey, or even pedestrian survey with relatively large distances (100 m) between surveyors, will simply miss small sites (Rosen 2003a). In short, the methods utilized in surveys and excavations of massive sites do not translate to smaller scales, and the ephemeral (and not so ephemeral) sites associated with pastoral societies have gone virtually unrecognized. These problems also extend to the basic definitions of what defines sites (e.g., Chang and Koster 1986; Foley 1981; see Saidel and Haiman 2014:1–6 for definitions employed in the course of Negev surveys). Thus, an early generation of archaeologists (e.g., Albright 1949:82–83; Kenyon (1964 [1980]:204–206), and even later researchers (e.g., Finkelstein and Perevoletsky 1990), claimed that archaeology as a discipline is fundamentally incapable of investigating truly nomadic cultures.

In terms of theory, approaches to Near Eastern archaeology have also limited progress toward an archaeology of mobile pastoralism. The text-driven nature of much Near Eastern archaeological research until recent decades has focused on those societies and sites identifiable in the texts. In the Levant, biblical archaeology, with its early focus on biblical illustration, is perhaps the most obvious example of a subset of a text-driven Near Eastern archaeology.

However, until recent times, the archaeologies of Mesopotamia and Egypt have also been tied closely to textual frameworks (for Greece, see Cherry 2003). From the perspective of an archaeology of mobile pastoralism, the problem with text-based archaeology is three-fold. First, the nature of ancient Near Eastern texts inherently focuses attention on the home cultures of the texts. Given the origins of written materials in urban and state-level societies, and the general illiteracy of pastoral societies, the texts themselves generate research questions that tend to focus research on the literate societies. Thus, for example, so much of the research on the Mari nomad texts is devoted to the relations between the nomads and the State (e.g., Fleming 2009; Porter 2012; also in general, Kupper 1957; Luke 1965; Matthews 1978); yet, in spite of clear references to nomads' *villages*, not a single such site has yet been even tentatively identified, let alone excavated.

Treatment of pastoral nomads in the texts is the second problem. Ancient accounts of pastoral peoples indeed exist. Thus there are textual references to the Nabateans as nomads (Diodorus Siculus XIX, 94), the Saracens (the Nilus narrative, Mayerson 1975), and the Blemmys (Strabo 17.1; Burstein 2008; Dijkstra 2012). These provide modern scholarship with important information, even the basis for major synthetic works (e.g., for the Mari nomads, Fleming 2009; Porter 2012; Rowton 1974, 1977). These accounts, however, are almost uniformly hostile (cf. Ibn Khaldûn 1967:122), primarily providing an external, settled zone perspective on pastoral societies. For scholars whose research is already focused on the civilizations of the settled zone, these texts serve, in a way, to divert research from the development of an archaeology of pastoral nomadism since issues of interest to settled zone research concerning pastoral nomads are often addressed in the texts. For example, Mayerson's (1994) classic text analyses of settled-nomad relations in the Negev and Sinai during Late Roman (Byzantine) times set a baseline of tension and hostility for understanding nomad societies in this period. Archaeological studies which tendered a more tempered view of these relations (e.g., Banning 1986) were relegated to microhistory, Mayerson's words. Parker (1986, 1987), digging Roman fortification systems in the periphery, the *limes*, also saw almost unmitigated tension in relations. That is, in a sense, no need was perceived to conduct an archaeology of nomadism when texts of direct relevance to sedentarynomad research were already available. The issue of bias in the texts, of course, was little acknowledged in those earlier stages of scholarship.

The final text-related problem, like the first, is also one of approach. The texts provide a handy historical narrative, based primarily on political events, personages, battles and wars, ethnic groups and conquests. Like the archaeology of prehistoric hunter-gatherers, geared fundamentally toward anthropological as opposed to historical questions, an *archaeology* of pastoral

nomads would have less to contribute to such narratives. Pastoral encampments are not easily identifiable with historic locales; historic personages cannot be easily identified with specific pastoral sites; and even chronologies may be more difficult to pin down. A Big Man view of history, or even a political historical view, is difficult to construct or sustain with small sites and poor material culture. This is not to say that such goals are impossible, but rather that they are easily perceived of as less practical.

Beyond the problems of a text-oriented archaeology, the ideologies of historical archaeology in the Near East, fueled by nationalism, competition between nations for prestige, and economics (Feige and Shilony 2008; Silberman 1982; Trigger 1989), were primarily engaged in the search for grandiose and impressive finds on the one hand, and, on the other, the discovery and reconstruction of societies which could be established as ancestral to later European civilization. In the classic cultural evolutionary schemes of the late 19th and early 20th centuries, the goals of archaeological research were closely tied into the idea of cultural progress, and the advance of civilization (Trigger 1989). Given such goals, the study of “primitive” pastoralists with scanty and poor material culture remains was hardly worthy of study.

If historical archaeologists were blind to the potentials of an archaeology of pastoral nomadism due to the nature of research methods and agendas, prehistoric archaeologists have been no less myopic. Prehistorians have long been practicing the archaeology of small-scale societies, both nomadic and sedentary. Animal bone analyses have been a feature of prehistoric investigations in the Near East from their inception (e.g., Bate 1937; Zeuner 1946), and stone tools, obviously, have been a prime focus for Stone Age archaeology. From the beginning of prehistoric archaeology in the Levant, small open air Paleolithic stations have been investigated in the desert (e.g., Buzy 1927; Neuville 1930; Stekelis 1956). In fact, the excavation of Paleolithic caves in the north almost always required the clearance of later materials, left virtually undocumented, and in many cases dung layers from proto-historic and historic period pastoralism. For example, Bar-Yosef and Goren (1973) note the presence of 2.5 meters of classical period dung accumulation at the Hayonim cave which needed to be removed in order to access the Natufian Layer B. Thus, although prehistorians had developed the field and analytic expertise for recognizing, excavating, and analyzing small scale sites, including pastoral nomadic sites, no different in methodological essence from hunter-gatherer sites, with the exception of some discussion of origins, in the Neolithic period, scant attention was paid to pastoral nomadism as a subject of further research (but see Bar-Yosef and Khazanov 1992). Pre-occupation with the Stone Age, and with its big questions of human evolution and dispersal,

and agricultural origins, seem to have blinded prehistorians to an entire human adaptation.

Falling on the methodological and theoretical seam between the sub-disciplines, the potentials of an archaeology of pastoral nomadism simply were not seen.

The Misapprehension of Mobile Pastoralism

The underlying assumptions behind claims that nomadic peoples do not leave archaeological identifiable remains are that: 1) Mobility is so great that their campsites do not impact the landscape in sufficiently intensive way so as to leave physical traces; and 2) Mobility is so great that material culture does not accumulate in quantities sufficiently great to find and analyze. These assumptions are based on the mistaken assumption that there are nomadic pastoralists who are essentially mobile all the time, that their seasonal round does not permit them to remain in a place long enough for sites to form, and that these people are so mobile that they are not capable of accumulating material goods. Furthermore, given that some types of campsites are well evident in the archaeological record, the adaptations represented by these kinds of sites are dismissed as representing semi-sedentary (or semi-nomadic) groups. This is circular reasoning; absence is assumed to represent presence without evidence, an assumption which cannot be contradicted by data and therefore is inappropriate to the conduct of scientific inquiry.

Beyond the issues of the nature of evidence, the assumption that there are such intensely mobile peoples is unsound and based on outmoded perceptions of nomadic societies. Even such groups as the al-Murrah, the nomads of the nomads (Cole 1975), or the Ruwallah (Musil 1928), on whom Johnson (1969) modeled his concept of horizontal nomadism, spend (and spent) extended periods of time encamped in sites to which they return(ed) regularly. In fact, the Bedouin described by Musil were so able to recognize abandoned campsites, some quite old, as to dedicate a genre of poetry to them (Musil 1928:78–85). Such sites, along with the set of special function sites attached to them, reflect patterned exploitation of conceptually structured landscapes (Meraiot 2011, 2013). There are no randomly wandering nomads and the structures of pastoral presence accumulate in non-random fashion. To claim otherwise is essentially to reduce these groups to stereotypes of wandering nomads, a throwback to long rejected paradigms of mobile peoples.

To be sure, not everything is preserved. In developed areas, much has been

destroyed over the course of millennia of agriculture. In some regions, like some areas of eastern or southern Africa, where stone is at a premium, preserved material culture may be rare and site remains difficult to identify (e.g., Smith 2008; but also see Marshall 1990; Robertshaw 1990; Shahack-Gross et al. 2003, 2008 for the rich archaeology of these peoples). This is not the case for the deserts of the Near East. In these regions, there were no invisible nomads, only vision-challenged investigators.

How to See Nomads

Three distinct realms of evidence can be drawn upon for the study of ancient nomads: the ancient texts, modern ethnography, and archaeological analysis of ancient remains. Ethnoarchaeology of modern nomads (and in general, modern peoples) constitutes a bridging category between ethnography and archaeology (cf. Cribb 1991; Gould 1978, 1980; Hole 1978; Kramer 1979; Watson 1979), but is really the study of modern groups. Although each realm has its own methods, potentials, and drawbacks, it is also clear that the study of ancient nomads must address and critically integrate each one.

Ancient Texts and Nomads

The corpus of ancient texts abounds with written references to pastoral nomads. These span a large spectrum of types of documents, including pilgrimage accounts (e.g., Mayerson 1994), treaties (e.g., Shahid 1995:266ff.), historical and descriptive treatises (e.g., Herodotus; Strabo; Diodorus), rock inscriptions (Anati 2015; Eisenberg-Degen 2012), victory proclamations (e.g., Redford 1990, 1992:269–275), and economic records (e.g., for 2nd millennium BCE Mari, Matthews 1978; for the Byzantine Negev at Nessana, Kraemer 1958). These materials provide a wealth of historical context and detail, often simply unavailable from any other source. A few examples will suffice to illustrate this wealth.

The Mari Palace Archives (Kupper 1957; Luke 1965; Matthews 1978) provide much material on the political structure of the tribal groups with which Mari was in contact, the nature of political and economic relations between Mari and the nomads, names of personages and thereby linguistic affiliations, and other historical details about pastoral nomadic groups in Mesopotamia in the mid 2nd millennium BCE. Rowton (e.g., 1974, 1977) synthesized much of this

material, describing a dimorphic society based on shifting relations between nomads and sedentary people. Based especially on records attached to nomads, but also on other parts of the archive, Fleming (2009) suggests that kings of Mari indeed were in part affiliated with these tribal groups. Somewhat later in time, Assyrian royal accounts (Eph'al 1984) describe military excursions against nomads in the middle 1st millennium BCE, complete with depictions of burning tents. The Egyptian El Amarna letters, royal correspondence from the late 2nd millennium BCE, refer to the Shasu, putative nomads threatening Egyptian allies in Canaan, placing them in a larger in a socio-political context (see [Chapter 10](#)). The Nessana Papyri (Kraemer 1958) record the sale of camels by nomads to the Roman garrison at the town, and other Byzantine (Late Roman) traveler and pilgrim accounts from the Negev and Sinai recount tales of massacres of monks by nomads, reminiscent of tales of Indian massacres in the Old West (Mayerson 1975, 1994). Other accounts refer to the conversion of at least one nomadic tribe to Christianity (Mayerson 1975). In the Negev, early Arabic rock inscriptions have been attributed to pastoral tribes (Nevo et al. 1993), although Sharon (1990) has made a strong case that these inscriptions derive from the settled villages of the area, and not the pastoral tribes. Most of the Negev rock art, not really texts, but included here as a best fit, has been attributed to pastoral tribes, recording tribal territories, identities, and in some cases, narratives (e.g., Eisenberg-Degen and Nash 2014). Similarly, Porter (2012) has attributed various aspects of Mesopotamian iconography to the roles played by tribal nomads in the development of classical Mesopotamian civilization.

With this wealth, however, it is clear that different types of texts provide different kinds of information, with varying degrees of reliability. Historical interpretation of these texts must consider their context, as well as their content. Thus, the Byzantine and early Islamic Nessana (non-literary) papyri (Kraemer 1958), recording crop yields, trade agreements, wills, etc., are less likely to be arbitrary or personally idiosyncratic in their perspective than, for example, accounts from roughly contemporary Byzantine pilgrims in Sinai (e.g., Mayerson 1975). The observations themselves are records, not accounts, and seemingly less subject to embellishment.

Several points are important to consider here. Foremost, none of the textual materials referring to nomads were written by the nomads themselves (excepting Nevo's [1991] claims concerning Negev Arabic rock inscriptions, which are unlikely [Sharon 1990]). The significance of this asymmetry in written sources cannot be underestimated.

Anticipating some of the critique of ethnography of modern Bedouin, the biases of ancient sources toward peoples seen as primitive or barbarian parallel those of modern research. Recent anthropological theory, most notably Said's

(1978) *Orientalism*, has well established the problematic nature of external perspectives and reconstructions of indigenous history (also see Borofsky 1997 for review of the critique). In this regard, for example, Saidel (1998:37–99, 2008a, 2009a; also Abu el-Haj 2001; Glock 1985 for perceptions of indigenous Arab society in general) has reviewed 19th-and early-20th-century preconceptions of Bedouin societies, concluding that preoccupation with biblical illustration relegated much of this work to the realm of stereotype. Although anthropology has tended to view Orientalism and other similar preconceptions of the “Other” as the result of specifically Western, colonial, and/or capitalist world views, the fact is that ancient texts reflect an almost uniform hostility toward the Amorites, the Saracens, the Shasu, the early Arabs, and whomever else. Characterization of the “Other” in negative terms, with all this might imply, is an ancient tradition.

Needless to say, an indigenous or internal anthropology/history would be no less biased. It would, however, provide a complement or balance to the external account.

Even given these biases, Saidel (1998:37–99) is careful to note that while cultural characterizations and general anthropological conclusions regarding 19th-and early-20th-century Bedouin suffer serious faults, essentially to the point of requiring total revision, the large bulk of field observations are nonetheless of much value. Similarly in regard to ancient texts, if they are read critically they are of immense value.

Ethnography, Ethnology, and the Study of Ancient Nomads

Like the ancient texts, the ethnographic record derives from a wide range of sources, with differing potentials and degrees of reliability for use by archaeology. In the Levantine deserts, the earlier part of the record includes observations made by soldiers and surveyors (Conder and Kitchener 1881–85), archaeologists (Macalister 1912; Woolley and Lawrence 1915), pilgrims and other travelers (e.g., Porter 1865; Twain 1869), biblical scholars and orientalists (Palmer 1872; Robinson and Smith 1841), proto-anthropologists (Doughty 1979 [1836]; Musil 1928), and administrators (el Aref 1944; Jarvis 1931). Early aerial photographs, especially dating from the First World War and the period afterwards, are also a valuable source for ethnographic data since tents can be identified in the landscape. These sources range from anecdotal tales of experiences with the Bedouin (Jarvis 1931), through stereotypical generalizations on their character as a race (Palmer 1872:74–76), and on to

detailed accounts and descriptions of material culture and customs (Murray 1935; Musil 1928). Anthropological *analyses* are rare.

More recent anthropological studies, histories, and syntheses have been more analytical and critical (for the Negev and Sinai see e.g., Bailey 1980; Kressel 2003; Marx 1967, 1977, 1992, 2006; Meir 1997; Meir and Karplus 2013; Stewart 1988, 1991). Archaeologists have also begun to engage in active investigation of the ethnographic record, documenting the “ethnoarchaeological” remains of recent pastoral nomadic groups (e.g., Avni 1992; Banning and Köhler-Rollefson 1986, 1992; Eldar et al. 1992; Goren-Inbar 1993; Hole 1978; Saidel 2008a, 2009b; Simms 1988; Simms and Russell 1997).

The use of these sources has been variable, ranging from a naive and even crude “biblical patriarchs = Bedouin” equation (e.g., Kressel 2003:11–12), to comparisons of site formation processes (e.g., Avni 1992; Simms 1988), models of economic relations (e.g., Banning 1986), and interpretations of archaeological features and material culture (e.g., Saidel 2009a). However, even given the greater sophistication of more recent research, the impact of modern states on traditional Bedouin societies would seem to render even these studies problematic for direct comparison with ancient times. This fundamental issue of ethnographic analogy as relating to an archaeology of pastoral nomadism requires further discussion.

The use of the ethnography of recent mobile pastoralists for archaeological interpretation can be examined at several levels. At the lowest and simplest, a specific ethnographic example can be grafted onto an ancient society in order to comprehend some similar element in that ancient society. Thus Finkelstein (1995: [fig. 5.1](#) from Musil [1908]) has presented a photograph of a Bedouin camp with tents ordered in a rectilinear pattern, and has claimed that Iron Age forts in the Negev represent a similar phenomenon, thus suggesting that the Iron Age forts are in fact pastoralists in the process of sedentarization. It is telling here that Musil (1908) makes no reference to sedentarization in this context. This kind of pick-and-choose analogy, in essence anecdotal, is arbitrary at best; when used uncritically, without context, it reflects the misuse of ethnographic analogy.

On the other hand, much of our understanding of material culture utilitarian function derives from direct analogy with modern times. The identification of grinding stones and sickle blades in the archaeological record as reflecting grain processing and harvesting derives from analogy with modern societies. In essence, such physical analogies assume that shared morphology of material culture dictates functional equivalence. Caution is obviously required, and even with respect to the examples above; grinding stones have been used for preparation of ochre (Wreschner 1980), and sickle gloss in some cases may be the result of threshing (e.g., Anderson et al. 2004; but see Rosen et al. 2015), or

perhaps the reaping of reeds (Unger-Hamilton 1989). Replication experiments (e.g., Coles 1973; Steensberg 1943) and computer simulations (Cribb 1987) are other examples of analogy at this level. The primary factors in establishing the reliability of the analogy are the rigorous replication of appropriate archaeological contexts, the number of examples, their selection, the consideration of counter-examples, and the specific questions asked of the analogy.

A higher plane of analogy consists of establishing some relationship between social or cultural structure and physical aspect from the ethnographic record, and then applying it to the archaeological, Binford's (1981b:21–34) middle range theory. Much ethnoarchaeological work focuses on these linkages. For example, attempts to reconstruct ancient demographic structure based on population density proxies (people per square meter, people per tent, etc.) use this kind of analogy (e.g., Naroll 1962), although to be sure, Kramer (1982:151–190) is clear about the great variability and complexities behind such calculations.

Reconstruction of pastoral social structure as based on settlement pattern and variation (e.g., Cribb 1991; Simms 1988) has also been a goal of such studies. A key element in the reliability of such analogies is ethnographic distance (Ascher 1961; Wylie 1985). The closer the two cultures are in time, space, and cultural continuum, the more reliable the analogy.² Statistical inferences, based on larger samples, such as Flannery's (1972) conclusions regarding the positive correlation between curvilinear architecture and mobility, also fall into this type of analogy.

The highest plane of analogy using the ethnographic present is that which assumes that generally similar lifeways allow historic or ethnographic extrapolation of social and cultural elements not directly observable in the archaeological record. Thus, for example, Levy (1983) concluded that the political structure of northern Negev Chalcolithic society was based on conical clans (segmentary lineages) due to a perceived settlement pattern analogy, although there is virtually no hard archaeological data for such a view. Although this level of analogy can be problematic, in fact, it both offers up hypotheses for later examination and provides the basic justification for the comparative method. The very assumption that there is an anthropological class called "pastoral nomads" rests on it. Needless to say, such analogies applied to specific cases require justification.

In fact, the use of the ethnographic or ethno-historic record for reconstructing the past, Binford's (1981b) "middle range theory", is predicated on the fundamental theoretical principle of uniformitarianism, the scientific axiom explicated most notably by Lyell (1837) in his *Principles of Geology*, that present day processes are the same processes that operated in the past and that

the world can be explained by reference to those same processes. If on the one hand this principle is indisputable, for social scientists the vast variability and complexity of initial conditions render uncritical uniformitarianism, analogy in a word, a difficult tool. A similar argument is, of course, made with respect to the weather, from which an entire theoretical framework, chaos theory, developed (Lorenz 1996). The science of meteorology is based on uniformitarianism, but weather forecasters have notorious difficulties in precisely predicting the weather. In fact, one might argue that a primary danger in the use of ethnography for archaeological or historical reconstruction lies in the assumption that precise ethnographic analogues, initial conditions, to ancient situations do indeed exist.

There are three sides to this issue. First, even without addressing the problem of historical particularism versus comparative method, "the effects of modern (Western) societies and technologies on pastoral lifeways are qualitatively of a greater order than the effects of ancient states on their pastoral complements" (Rosen 1992a:79). Technologies, mass markets and international demand, and much higher populations have altered modern nomadic groups to the extent that the appropriateness of direct analogy can legitimately be questioned. As an aside, the issue of isolation and cultural impact has received much attention in hunter-gatherer studies (e.g., Headland and Reid 1989; Schrire 1980; Solway and Lee 1990; Wilmsen 1989), presumably since prehistorians have drawn considerably on such studies for modeling Pleistocene societies. The issue of recent impact on such societies is obviously crucial if they are to be adopted as models for prehistory. With respect to the study of pastoral nomadism, the question has not been seriously addressed, among other reasons presumably because the anthropology of pastoral nomads has focused on recent peoples, and much less on models for understanding ancient groups or social/cultural evolution. That pastoral nomads in the Near East and Eurasia interacted with sedentary societies over the course of millennia is an historical given; they have never been seen as isolates.

On the second side of the issue of the existence of appropriate analogs, even without reference to modern influences on tribal groups, there are phenomena for which no ethnographic analogy can exist. Thus, in the investigation of origins, if the conditions which brought about the rise of pastoral nomadism were altered significantly by the process itself, then no ethnographic analog for those conditions can be present virtually by definition. Thus, for example, the adoption of sheep pastoralism by the Navajo, a process which began perhaps as early as the 16th century CE. but only crystallized in the mid 19th century, was deeply embedded in the politics and economics of the colonial states, Spain and the United States (Brugge 1983; Kluckhohn and Leighton 1962:35–44). Over the course of the roughly 8 millennia since the beginning of desert

herding in the deserts of the Near East, the plant communities themselves adapted to and were modified by grazing by sheep, goats, and camel (e.g., Perevoletsky 1995). The adoption of domestic reindeer among many of the northern reindeer hunters occurred in the contexts of the modern state (Ingold 1980). Such deeply asymmetric processes, tied intimately to the huge markets of modern times and the political power of the modern state, cannot provide direct analogs to ancient processes (although this does not deny that important insights cannot be derived). Similarly, long-term processes, spanning hundreds of years, cannot be addressed from an ethnographic record based either on the “ethnographic present” or at most on some 100 years of systematic research.

Finally, the very assumption of analogy may inhibit the construction of original hypotheses. That is, too close a tie into explanation by ethnographic analogy can result in the forcing of our square data into preconceived round analogies, and, concomitantly, the failure to construct new paradigms which would better fit the data (Binford 1967; Gould and Watson 1982).

Given these qualifications, it is clear that on the one hand, argument by analogy is present in all archaeological interpretation. On the other, the pitfalls are abundant, and the use of analogy for archaeological explanation must be both explicit and critical. However, the real value of ethnographic analogy lies not in the testing of hypotheses, but in their generation (Binford 1967). Acquaintance with the ethnography of pastoral nomads, both on the specific and the general levels, demonstrates the broad range of possible interpretation, rather than restricting it. It is for the direct evidence of archaeology and history working with these constructs, and with others, to establish an anthropological and historical narrative.

The Implications of Archaeological Methods

The fundamental contrasts in the nature of the archaeological remains left by nomadic pastoralists, akin to those of hunter-gatherers, and the city and village sites which are the focus of historical archaeology in the Near East, account in part for the curious absence of an archaeology of pastoral nomadism in this region. These contrasts span such aspects of the archaeological record as site size and depth, the nature of the architectural remains, density and diversity of artifacts, as well as site formation processes. For the archaeologist, these differences in the nature of the sites also require different methods for their discovery, excavation, and analysis. In essence, the methods of prehistoric archaeology are a prerequisite for an archaeology of pastoral nomadism (Rosen 2011a:199–202).

Examination of these methods can be divided into three fields: survey, excavation, and analytic methods. Each requires separate review.

Basically, field survey for pastoral nomadic sites requires intense and systematic coverage, conducted so as to record the smallest “sites” possible. These include small sherd and lithic scatters, isolated stone concentrations, hearths, cairns, etc. Thus, pedestrian survey is a necessity since such sites cannot be seen either from moving vehicles, or, for that matter, detected by any remote sensing devices (including aerial photography) now in use.

The problem of sampling is a contentious one. In terms of the physical discovery of numbers of sites, there is little difference between a 10% survey of 1000 square km and a 100% survey of 100 square km, assuming settlement homogeneity and such variables as distance between surveyors and site-recording criteria are constant. Of course, the scale of the target universe will affect sampling strategies, as will resources available. The mobility inherent in the pastoral nomadic adaptation may prohibit recovery of a full residential system in a single survey. A yearly cycle extending over an expanse of 500 km, as for example the Ruwalla, the al-Murrah, or the Bakhtiari, offers unique problems to archaeological survey. Even imagining only a 1 km transect, to catch a sample of such a system, one must exhaustively survey 500 square km, a very large survey universe. No less significant, without prior knowledge, there is no way one could know to survey such an area and it is likely that large parts of the seasonal settlement pattern would not be incorporated into some hypothetical reconstruction based on survey results.

The issue of site visibility is paramount. Vegetation cover and alluviation can mask and bury sites so as to leave no traces. Development can destroy sites. Desert environments like the Negev, Sinai, and the Badia of Eastern Jordan are ideal for reconnaissance of pastoral nomadic sites since they are usually undeveloped, unvegetated, and are dominated by erosion rather than alluviation. In other regions, discovery may depend on chance finds in wadi sections, road cuts, or as squatters’ remains on other sites.

Recognition of the significance of such phenomena is a key element in this work. Field recording must be exhaustive and rigorous enough for the registration of all those small features not normally incorporated in surveys at sites. Needless to say, basic descriptive information such as site size, location, features, artifact attributions and density, etc. ought to be included in field descriptions. Other information of importance includes natural features such as wadis, cliffs, terraces, rock shelters, etc. which may have relevance for interpretation of the settlement pattern (cf. Chang and Koster 1986). Most recently, Geographic Information Systems and various remote sensing techniques are being integrated into settlement pattern analyses (for the northern Negev, e.g., Fletcher 2008; Winter-Livneh et al. 2010, 2012), even

among sites which are indeed attributed to pastoralists at one level or another (e.g., Abu-Azizeh 2010; Beck et al. 2007; Lawrence et al. 2012).

The difficulties of pastoral archaeological survey beyond the desert are formidable. However, both the fact of prehistoric archaeology in such regions, and the documentation of more-recent pastoral encampments (e.g., Chang and Koster 1986; Cribb 1991; Hammer 2014; Yekutieli 2007) suggest that it is not impossible. At least some of the controversy concerning the archaeology of mobile pastoralists derives from the difficulties of identifying pastoralists penetrating from the desert areas into the Mediterranean zone, a circumstance well known from recent historical periods (e.g., Eloul 2010) and presumably common to ancient times as well (as reflected, for example, in the biblical book of Joshua, whether historically reliable or not). Although beyond the scope of this work, there are indeed significant methodological issues here. First, in the constant modification of the landscape, the result of agriculture and development in both ancient and modern times, small sites may well have been destroyed en masse. Second, in the process of such settlement shifts, pastoralists may also modify basic residential patterns. Cribb (1991:150, 182–183) documents the reuse of older buildings by pastoralists, a kind of squatter's adaptation, which may indeed be difficult to identify. Of course, the issue of adaptive shifts in settlement toward more sedentism and supplementary (or even primary) agriculture leaves open the entire question of defining mobile pastoralists in general in such changing circumstances.

Excavation of pastoral encampments requires closer provenience control and more exhaustive collection procedures than for village and city sites. Material culture assemblages are rarely rich in these societies, and unlike villages and cities, over the long term, camps tend not to accumulate one atop the other. Therefore, all artifacts, in their specific contexts, are important. The locus-basket method and its variants (e.g., Lance 1978), used in one variant or another over the entire Near East, do not provide the detail for reconstruction of site structure in the absence of significant architecture, and grid systems are a necessity. Stratigraphic control must be on the basis of the lens or the small arbitrary spit, and not the building or construction phase or stratum (to be sure, accounted for in most recent tell excavation methods). In fact, the existence of true vertical stratigraphy would be surprising at a short-term encampment, although horizontal stratigraphic sequences are common (e.g., Rosen 2001; also see Saidel and Erickson-Gini 2014 for recent Bedouin camp horizontal stratigraphy). Given the quantitatively poor material culture assemblages to be expected at nomadic sites, and the small physical size of much of the artifact inventory, sieving of sediments and non-selective collection of all artifacts is of the essence. Preservation of organic materials may be poor as a result of shallow depths. Thus, faunal samples will also be

much improved by such procedures, enhancing recovery of microfauna, as well as such small items as fish bones. In fact, in the absence of midden accumulations, organic preservation is likely to be poor; the mere accumulation of a midden implies a longer term presence.

A host of scientific techniques also requires special field collection. Soil samples of various sizes may be collected for analyses of phytoliths, sedimentology, spherulites, phosphates, microartifact studies, and flotation for recovery of botanical remains and charcoal for dating and identification. Soil micromorphological analysis requires sampling in special tins to preserve soil structure. Each of these methods can provide specific information on pastoral lifeways.

Archaeological analysis of pastoral nomadic systems also differs in part in focus from much of traditional Near Eastern archaeology, drawing its primary inspiration from anthropology rather than history. Although the distinction is more difficult to draw in recent years, as more anthropological archaeologists work in the Near East, several differences can nevertheless be noted.

First, the characterization of archaeological remains as pastoral nomadic still requires exploration. Cribb (1991:151–152) has noted the difficulties of distinguishing pastoral re-use of abandoned sites from peasant squatters, and has attempted to define signature remains for pastoralists (cf. Hole 1978). This is no trivial task. Hole's (1974) identification of Tepe Tūlā'ī, in Iran, as a PPNB pastoral encampment based on the scrappiness of the architectural remains was later disputed by Wheeler Pires-Ferreira (1975), whose analysis of the animal bones suggested village-based pastoralism. Rosen and Avni (1997:62–80) have noted the functional contrasts in ceramic assemblages between pastoral nomadic camps (dominated by cooking ware) and permanently occupied hamlets and villages (dominated by storage ware) (also Saidel 2002/4). Saidel (2002a) has noted the lesser diversity of ceramic assemblages among Early Bronze Age pastoralists in the Negev and Juli (1979) has suggested a similar scheme for lithic assemblages. Ambrose and DeNiro (1986) note the differences in isotopic signatures in bones according to diet, distinguishing between fishers, pastoralists, and farmers in modern Africa as well as for ancient hominins. Using similar methods, Shishlina et al. (2009) concluded that early steppe pastoralists also relied on significant marine resources. Stable isotopes have also been used to define actual sites, leaving dung signatures in East African sites (Shahack-Gross et al. 2008). Sedimentological and chemical signatures, including phytolith analyses, micromorphological structures, and mineralogy, have also been used to identify historically known pastoral enclosures in the same region (Shahack-Gross et al. 2003). Microscopic calcium carbonate spherulites have been shown to be produced most especially in the intestinal tracts of sheep and goats (Canti

1997) and can also be used to identify pastoral activities (Brochier et al. 1992), although the association with herd animals is not exclusive (e.g., Canti 1997; Goren 1999). Phytoliths have also been used to identify dung deposits.

The study of seasonality and ecological relationships clearly plays a major role in archaeological analyses of pastoral societies and has been addressed using a variety of methods including material culture analysis (e.g., Henry 1992), seasonality of fauna³ (e.g., Rosen 1992b), and the presence of flowering parts of plants reflected in the phytolith record (e.g., for village sites Jenkins and Rosen 2007; A. M. Rosen 2005). Directly related to this, relations between nomads and settled peoples are also a focus of archaeological research (e.g., Szuchman 2009). Such relations may be evident archaeologically in patterns of exchange, material culture influences and diffusion, shifting settlement patterns, changing demographic patterns, and faunal assemblages. LaBianca (1990) has suggested that faunal assemblages at the Iron Age site of Heshban, in Jordan, reflect exchange with mobile pastoralists beyond the settlement. The *Nessana papyri* (Kraemer 1958) reflect a similar phenomenon, with camels and donkeys imported from the desert. Indeed, the dominance of goat and sheep bones in the faunal assemblage at Nessana (Jackson 1962) belies the absence of all mention of these animals in the *papyri*.

Differences in research goals, like the greater stress on ecological relationships, affect data collection, which in turn can inspire new research directions. Studies of site organization are possible only with fine-grained provenience and systematic artifact collection. Haimi and Rosen (2011) were able to reconstruct patterns of intra-site activities (e.g., bead production, milling stone manufacture, waste discard, penning, etc.) at the pastoral Camel Site (ca. 3000 BCE) in the Central Negev based on artifact distributions, refitting of lithic artifacts, microarchaeological distributions, and stratigraphy.

Chronologies based on material culture, fossil indices and the like, are more difficult in the archaeology of pastoral nomadism. Abu-Azizeh et al. (2013, 2014) refer consistently to Chalcolithic/Early Bronze Age sites in eastern Jordan, a span of at least two millennia, because great precision is not possible based on survey materials. Similarly, Anati (2015:40) refers to the Bronze Age Complex (BAC) in the Negev and Sinai because his survey data did not allow better resolution in the desert sites. Although it is clearly of importance that pastoral nomadic sites be dated, the materials deriving from such sites are usually so poor as to offer little for the actual construction of chronologies. Similarly, the stress on political history so evident in Near Eastern archaeology, and especially in the Levant, is mostly a function of texts. Although scholars working on historical pastoral nomadic sites have been able to mesh this archaeology with political history as it relates to the linked settled societies (e.g., Avni 1996; Haiman 1995; Rosen 2000), the goals of an archaeology of

pastoral nomadism focus more on the tribal groups themselves.

Integrating Texts, Ethnography, and Archaeology

Although the focus of this book is on the archaeological analysis of pastoral nomadism, it cannot be stressed enough that the ultimate goal of our research is the integrated and critical study of ancient nomads. Any single realm of evidence will often suffice to supply a narrative to be plugged into a specific time and place, and in many instances perhaps even most, a single line of evidence is all that is available. Nevertheless, the limitations of such narratives should be clear, and the advantages of more integrated studies require little explanation.

Beyond the study of a specific culture, the integration of the texts, ethnography, and archaeology also provides us with critical insights into each of these realms as a source. That is, in addition to the added context and background which each source brings to the other, the discordances and discrepancies between them are of no less importance. First, such discrepancies can serve to outline the shortcomings of one or the other source when used alone. Perhaps more important, the divergences between reconstructions based on different sources stimulate debate, as in the questions surrounding relations between nomads and the Roman and Byzantine empires (e.g., Banning 1986; Mayerson 1994; Parker 1986, 1987), ultimately raising new questions (also see discussion in [Chapters 10, 11](#)).

However, beyond the cross referencing and cross-critique, archaeology is the new kid on the block in terms of desert pastoralists. As an independent discipline, it offers up questions simply in offering up a new and independent data set. Issues such as the rise of tent nomads and architectural adaptations among desert dwellers (e.g., Rosen and Saidel 2010), nomads and the evolution of the copper trade (Merkel and Rothenberg 1999; Rothenberg and Glass 1992; Segal and Rosen 2011), the impact of different kinds of pack animals amongst desert dwellers (e.g., Ovadia 1992; Rosen and Saidel 2010), and shifting settlement patterns among desert tribes in different periods are all questions not available by reference to other kinds of evidence.

Notes

¹ Thus, the *International Journal of Historical Archaeology*: “Exploring a wide-range of

topics, articles focus on the post-1492 period and include studies reaching into the Late Medieval period.” From “Aims and Scope.” (<http://www.springer.com/social+sciences/anthropology+%26+archaeology/journal/10761>).

- 2 As an unquestionably connected aside, the four-field anthropology of North America, with socio-cultural anthropology, linguistic anthropology, physical anthropology, and archaeology (paleoanthropology) integrated into single academic departments, is linked directly to the origins of American anthropology studying the indigenous peoples of the Americas, the modern cultures being studied perceived as being immediately linked in a close cultural continuum to archaeological remains (the Moundbuilders controversies notwithstanding). No such *direct* linkages between deep prehistory and modern societies were assumed in Europe, and departments of archaeology developed independently of departments of anthropology. Culture-historical archaeology in Europe attempted to link up modern and ancient peoples, but anthropologists did not study modern peoples to gain direct understanding of ancient ones.
- 3 The use of age profiles from faunal assemblages is a common means of determining seasonality on hunter-gatherer sites. It has been little employed on pastoral encampments due both to the scarcity of such assemblages, but also because even in their presence, samples are prohibitively small.

The Environmental Background to the rise of Pastoral Nomadism in the Southern Levantine Deserts

Introduction

The deserts of the southern Levant are situated in the expanses beyond the Mediterranean zone coasts and hills on the southeast rim of the Mediterranean Sea. In terms of modern states, the areas under discussion include most of the Egyptian Sinai Peninsula, the Israeli Negev, the Arava Rift Valley shared by Jordan and Israel, and the Jordanian Plateau beyond the better-watered areas of the Mediterranean zone (Fig. 5.1), an area of more than 50,000 square km, depending on where precisely its edges are delineated. Although the modern political borders have affected the conduct of research, they are constructs of modern politics with no historical depth, and have no meaning for earlier times. Bienkowski (2006) has noted this problem with respect to historic periods for the Arava, but the effects of modern political borders are evident even for the prehistoric periods (Rosen 1991).

Conceptually, the region is defined here as that which functioned as a desert periphery, at different times, to the Mediterranean zone, the idea of periphery and core relations being one of the themes associated with the rise of pastoral nomadic societies. Thus, the Negev, extending due south of the Mediterranean zone to the Gulf of Aqaba/Eilat, serves as a primary focus of this work. This region consistently served as a frontier for the settled populations farther north. The adjacent regions of the Sinai Peninsula and the Jordanian deserts are crucial; the Negev was never a closed system, the same pastoral cultures inhabited the neighboring regions as did the Negev, and the different researches conducted in the different areas complement one another. It is only by looking at the larger region that one can see the larger picture, both chronologically and geographically.

More specifically, to the west and south of the Negev, the Sinai Peninsula is

included in the general study area. Although historically the Sinai has as often functioned as a periphery to Egypt as it has to the Levant, its incorporation into the Levantine Pre-Pottery Neolithic B Interaction Sphere (for lithic paradigm connections see e.g., Gopher 1989a, 1989b, 1994:243–261), and the clear cultural and economic relations maintained between South Sinai and the southern Levant through the Early Bronze Age (and in some later periods as well) (e.g., Hoffmeier 2012) are indicative of a basic level of integration, again one of the primary concerns in the development of pastoral nomadism.

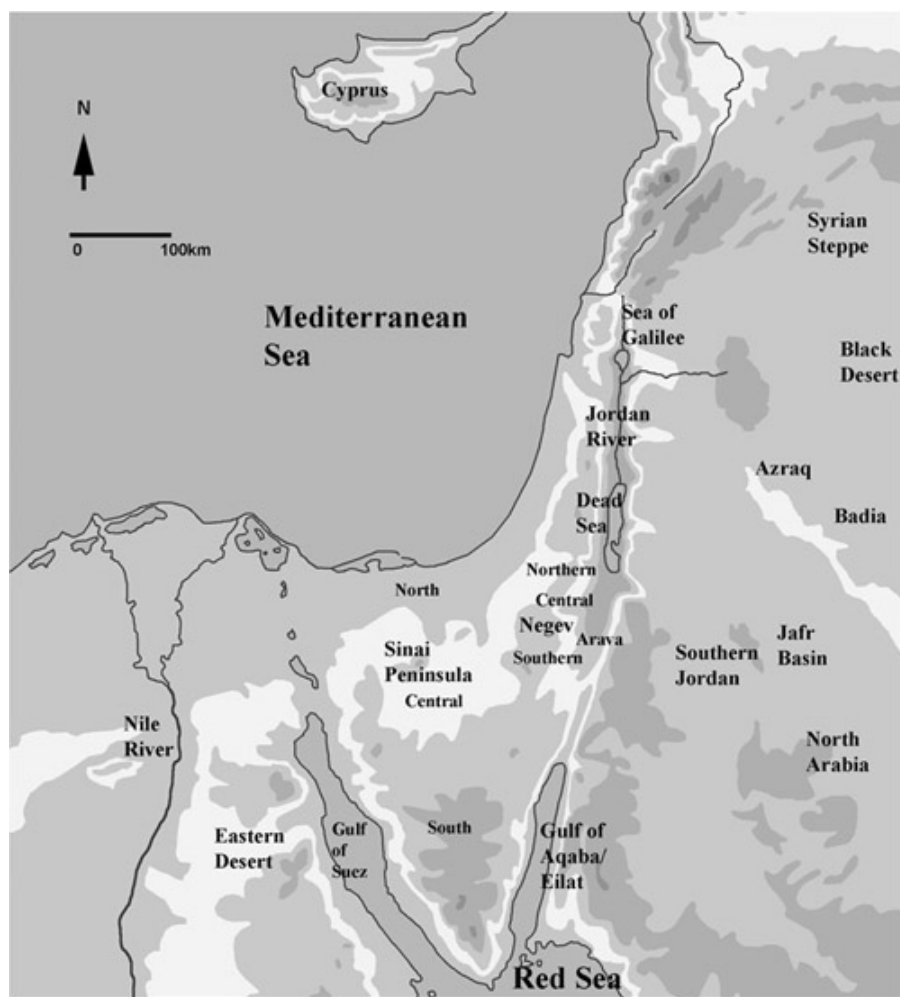


Figure 5.1 Map of the Levant with areas mentioned in chapter.

The Jordanian desert to the east, including what is in essence North Arabia, is perhaps the most difficult region to delineate properly for this study. If, on the one hand, in the south the deserts and towns of the Arabian Peninsula were historically basically independent of the Levant, both economically and

politically (although connected through trade systems at various times), on the other hand, the Badia, the eastern desert of Jordan (including the Azraq Basin, the Jafr Basin, and their environs) have been tied to the Levant from at least the Pre-Pottery Neolithic, if not earlier (e.g., Garrard and Byrd 2013; Kohler-Rollefson 1992). Thus, North Arabia forms a vague edge beyond the southern Levantine deserts, as does some area beyond Azraq, where presumably Mesopotamian and Syrian influences begin to dominate.

The desertic nature of the entire region is especially well evident in two basic variables: rainfall and vegetation. Rainfall gradients are quite marked with rainfall decreasing as one moves both south and east of the Mediterranean zone. Thus, the Beersheva Basin, in the northern Negev, today receives an annual average of ca. 200 mm of rainfall (Evenari et al. 1982:32; <http://gsabulletin.gsapubs.org/content/123/5-6/873/F1.large.jpg>), the accepted minimum for subsistence dry water farming (based on barley), the Central Negev Highlands receives 100–125 mm per year, and the Eilat/Aqaba area only 25 mm. East from the Mediterranean zone, Amman receives some 200 mm of rain per year, whereas the Azraq Basin, about 100 km east, receives less than 100 mm/year (http://www.lib.utexas.edu/maps/middle_east_and_asia/jordan_pol_2004.jpg).

In addition to these general gradients, the specifics of rainfall areal distribution are affected greatly by topography, the higher hills and mountains receiving more rainfall than the plains and valleys. Thus, the high mountains of South Sinai, the Central Negev Highlands, and the mountains of southwestern Jordan receive greater rainfall than their latitudes might lead one to expect. Rainfall shadows are another influence on rainfall distribution and, for example, result in the near absence of rainfall in the Arava Valley.

Seasonal distribution of rainfall, and general variability in that distribution, are also significant. First, although removed from the Mediterranean itself, the Mediterranean circulation system is still the primary determinant of rainfall distribution. Thus, the little rainfall that does fall in the southern Levantine deserts falls exclusively in the winter months, from November through April, concentrating in December–March. In contrast to lake formation in eastern Arabia (Parker et al. 2006), the southern Levantine deserts do not seem to have been significantly affected by Indian Ocean summer monsoons (see Enzel et al. 2008 for the effect of the physical structure of the region on Negev aridity), and the remainder of the year is dry, requiring special drought-resistant adaptations from plants, animals, and human populations (Evenari et al. 1982).

Beyond this marked seasonal distribution, rainfall also shows extreme variation in quantity and distribution within the winter months, and from year to year. Bruins (2012) has noted the major shifts in boundaries between hyper-arid, arid, and semi-arid in terms of rainfall patterns within the single decade

of the 1990s. Other areas are no less variable. Thus, average rainfall figures have little meaning, and comprehension of the basic climatic instability is essential for understanding the nature of desert adaptations.

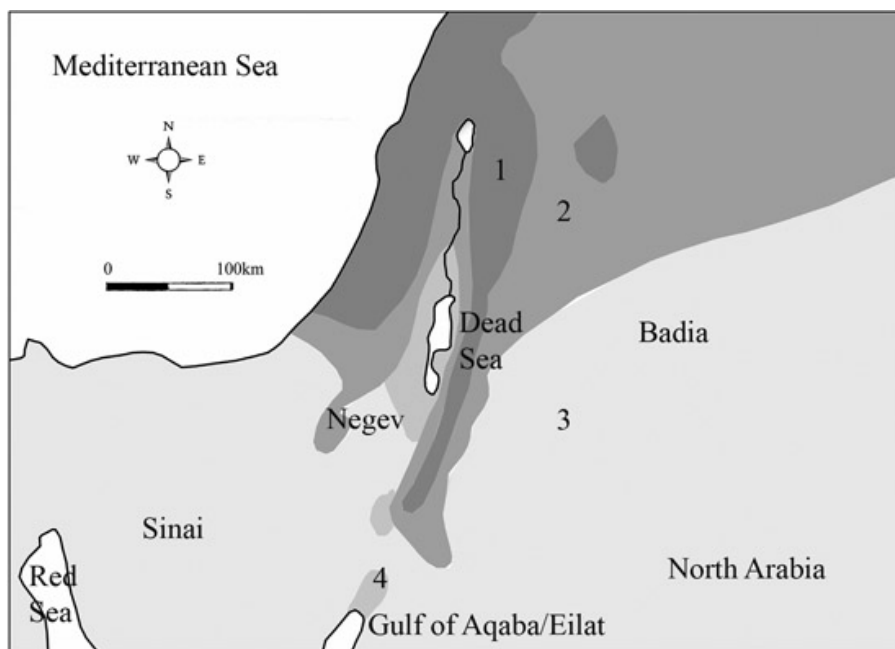


Figure 5.2 Schematic vegetation map of the Levant and its surrounding deserts (after Zohary 1953, 1956). 1. Mediterranean zone, 2. Irano-Turanian steppe zone, 3. Saharo-Arabian desert zone, 4. Sudano-Deccanian tropical zone.

Vegetation zonation (Danin 1983; Zohary 1953, 1956) is also a good indicator of the desertic character of the region (Fig. 5.2). The core Mediterranean Zone (oak and oak scrub forests) is bounded by a variable band of Irano-Turanian steppe, composed of scrub and brush vegetation, dominated by *Artemisia herba alba* and *Anabasisa hausknechti*, with stands of relict *Pistachia atlantica* in wadis and low-lying areas. The better-watered areas of this steppe zone show greater vegetation cover, while farther south and east, ground cover decreases. The Saharo-Arabian vegetation zone, dominated by low scrubs—*Haloxylon salicornici*, *Zygophylletum dumosi* and *Anabasisidetum articulatae*—begins beyond the steppe at roughly the 100–50 mm rainfall isohyet, and includes the larger areas of extreme aridity. Vegetation cover is even scarcer than in the degraded steppe zone. Patches of relict tropical Sudano-Deccanian vegetation, characterized especially by *Phoenix dactylifera*—*Juncus arabicus*, *Tamarix*, and halophytic vegetation (e.g., *Nitratria retusa*), are located in and around oases, most notably in the Arava Rift Valley, the result of aquifer

exposures caused by the evolving Rift graben.

Geographically, the region is comprised of a mosaic of sub-units whose environmental variability is important. Although these units tend to grade into one another, in this volume they are divided into three large units: the Sinai Peninsula, the Negev, and the Jordanian deserts of eastern and southern Jordan. The location of these regions and their subdivisions are shown in [Figure 5.1](#).

The Sinai Peninsula is bounded in the southeast and the west by the two northern arms of the Red Sea—the Gulf of Eilat/Aqaba and the Gulf of Suez—and in the north by the Mediterranean Sea. It connects to Egypt in the northwest and continues into the Negev in the east. It may be divided into four sub-regions:

1. Northern Sinai consists of the Mediterranean coastal areas of Sinai. It is dominated by dune systems, but also provided the main land link between Egypt and the southern Levant (e.g., Oren 1973; Yekutieli 2002).
2. Central Sinai is a large dissected plain, draining north, but hyper-arid such that little water actually reaches the Mediterranean.
3. South Sinai is a region of high igneous mountains.
4. The Red Sea coasts are marked by beaches and springs.

Regional differences in rainfall and vegetation are reflected in [Fig. 5.3](#). Of particular note is the somewhat higher rainfall, and resulting patch of Irano-Turanian vegetation, in South Sinai (Danin 1983:fig. 24). This region is also rich in minerals, for example copper oxides and turquoise, both of which play roles in human settlement in the region.

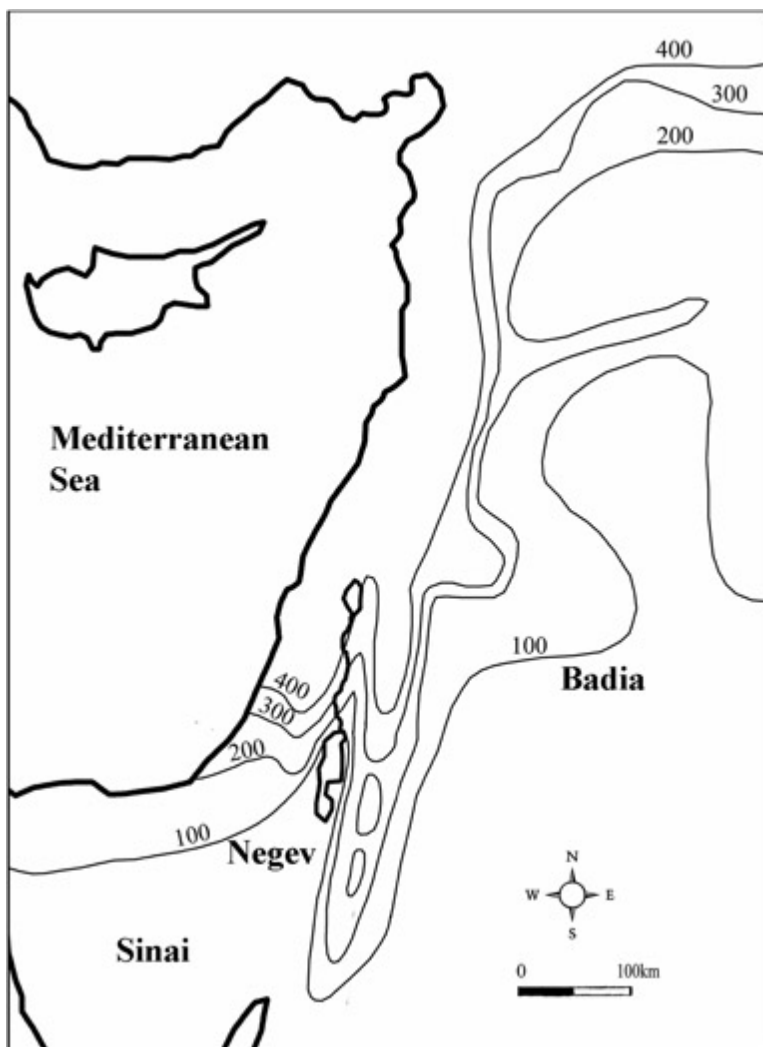


Figure 5.3 General rainfall patterns in Levant (modified and extended after Zohary 1953, 1956). Isohyets in mm.

The Negev is a triangular area extending roughly from the Mediterranean coast to the Dead Sea, and south from each side to the Gulf of Aqaba/Eilat (especially see Evenari et al. 1982; Stern et al. 1986). It also may be divided into three very general sub-regions, plus the Rift Valley, shared by modern Jordan and Israel (Fig. 5.4):

1. The loessial plains of the northern Negev receive enough rainfall to make dry farming practicable at the subsistence level in modern times. These plains grade into the dunes of northern Sinai and the Israeli coastal plain.
2. The Central Negev Highlands consist of five parallel ridges of hills and

valleys, achieving peaks of around 1000 m in elevation. The higher elevation results in somewhat increased rainfall, and thus a degraded Irano-Turanian steppe vegetation system.

3. The Southern Negev is a dissected plateau dominated by Nahal (Hebrew for *wadi*) Paran, the largest wadi system in the Negev. The region is hyper-arid.

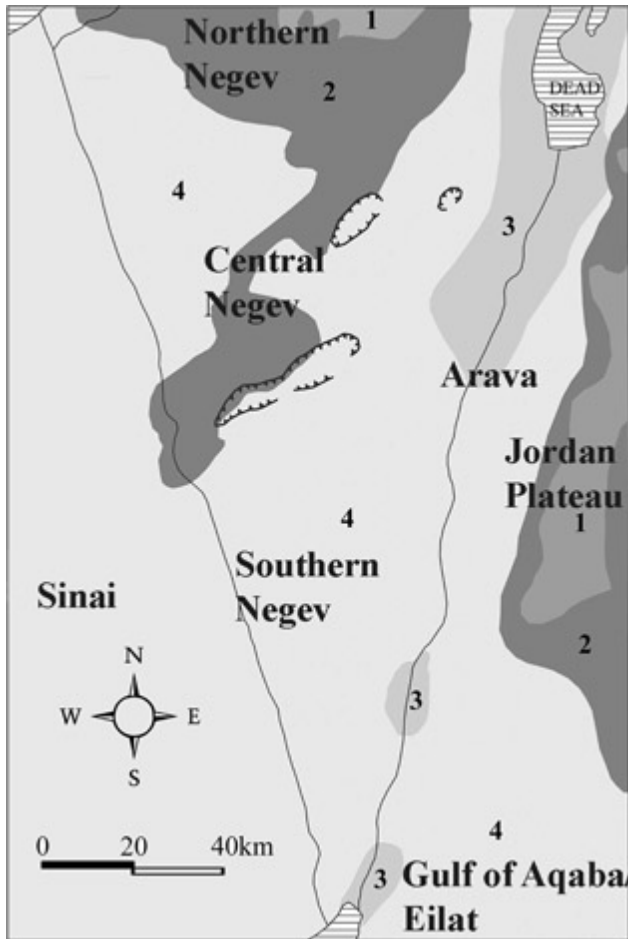


Figure 5.4 General map of Negev, with phytogeographic communities. 1. Mediterranean zone, 2. Irano-Turanian steppe zone, 3. Sudano-Deccanian tropical zone, 4. Saharo-Arabian zone.

Although often included as a fourth sub-region of the Negev, the Arava Valley is geographically located between the hills of the central Negev and those of the Jordanian Plateau. This geological graben, part of the African-Syrian Rift system, is lowest at the Dead Sea, ca. 400 m below mean sea level, rises to some 200 m amsl, before descending again to the Gulf of Eilat/Aqaba. It is especially notable for its numerous springs and patches of tropical

vegetation, in spite of a near absence of rain.

The Eastern Desert of Jordan, the Badia (Betts et al. 1998:1–4, 2013:1–2, 6), is a northward extension of the Arabian Desert. It is marked by general hyper-aridity, with rainfall exceeding 100 mm only in the west, on the fringes of the Mediterranean zone and the high ridge immediately east of the Rift Valley. On average this ridge rises to altitudes of 800–1200 m (the southern ridge is higher than in the north), whereas the Azraq Basin in the north and the Jafr Basin in the south are several hundred meters lower, as are the expanses east of Aqaba. These areas of Jordan are dominated by low basalt hills, with limestone plains appearing only farther east.

The Azraq Basin, east of Amman, although hyper-arid in terms of rainfall, contains numerous perennial springs due to its topographical situation as a basin and with additional rain-fed standing water pools present for much of the winter season (e.g., Garrard 1998; Garrard et al. 1985). In contrast, the Jafr Basin, farther south, shows more limited water resources, but like Azraq, has standing pools during the rainy season (Abe 2008:27–32; Rech et al. 2007). Thus, where the Negev shows a climatic N-S climatic gradient that in Jordan is E-W, the hyper-aridity mitigated only by internal drainages allowing formation of winter pools of water.

Geographic variability is evident from larger perspectives as well. If the entire region is arid to hyper-arid, external geographic connections also affected historical development. The Rift Valley was not only a hyper-arid rain shadow desert with oases, but also a land bridge between the Red Sea and the Mediterranean. The Azraq Basin may well have served as a way station between Mesopotamia, the Levant, and Arabia in some periods (e.g., Stein 1940). The Negev/Sinai link between the Red Sea and the Mediterranean offered potential direct cultural connections not readily available to the peoples of the Jordanian Desert, most evident, for example, in the evolution of Nabatean trade systems during the Classical era. Different regions also offered different mineral resources targeted for exploitation at different times by both indigenous desert peoples and their various sedentary cousins. Thus, Early Bronze Age and Chalcolithic tabular scrapers from large mines in eastern Jordan (e.g., Abe 2008), copper from all periods from the Arava and South Sinai (e.g., Merkel and Rothenberg 1999), Early Bronze Age sandstone milling stones from the central Negev (Abadi and Rosen 2008), different kinds of greenstone from the deserts in general most notably in the Neolithic (e.g., Wright and Garrard 2003), sea shells from the Red Sea in all periods (e.g., Bar-Yosef Mayer 1997, 2005), and basalts from the Jordanian plateau in the Chalcolithic and Early Bronze Age (e.g., Gilead 1995:310–321) all transported from the desert to the settled zone at different times, often mined or traded by desert pastoralists. The importance of this geographic variability should not be underestimated. It

significantly affected (indeed, still affects) settlement systems in all their particulars, including site size, site densities, subsistence and mobility patterns, and exchange.

Paleoenvironments and Climatic Change

Climate and environment in the southern Levantine deserts have not always been as they are today. Throughout the Pleistocene, climatic fluctuations and environmental shifts effected significant landscape changes (e.g., Cordova 2007; Goldberg 1984; Goldberg and Rosen 1987; Goodfriend 1987, 1988, 1991; Horowitz 1979) with sometimes profound influences on human settlement (e.g., Goldberg and Bar-Yosef 1982; Goring-Morris 1987:416, 442–448). However, Holocene environmental and climatic changes in the deserts and in the Near East in general have been the subject of some controversy, with some scholars claiming a virtual absence of significant climatic or environmental change in some periods (e.g., Liphshitz 1986; Rubin 1989), to others suggesting the occurrence of environmental catastrophes, resulting in civilizational collapse (e.g., for the Levant, Issar and Govrin 1991; Issar et al. 1991; for the eastern Mediterranean and Near East, Weiss et al. 1993; Weninger et al. 2009). The simplistic reduction of climate change to a single variable and then the correlation with social change, as if social change too can be evaluated as a single variable affected in a direct causal relationship with “climate change”, can offer no explanation for the richness of human responses to varying climate and environment (e.g., A. Rosen 2007).

There is incontrovertible evidence indicating that climatic and environmental changes occurred in the Levantine deserts during the last 10,000 years. These changes have sometimes been on scales large enough to have demanded significant social response. However, the reconstruction of climate and environment on a scale which might allow association with human action over the long term, with a precise chronology, is difficult. It requires the integration of different and disparate realms of evidence, and the extrapolation of trends for areas and periods for which no direct evidence is available. Attaching the specifics of that sequence to human responses in some kind of causal or explanatory relationship is even harder, requiring much more than the typical *ad hoc*, *there-was-a-climate-change-and-it-coincides-with-social-collapse* kind of approach.

Each of these points requires some brief discussion before attempting even a summary review of the paleoenvironmental sequence in the region. The

problem of chronological precision is a crucial one for synthesizing a climatic sequence and integrating it with a culture history. First, different dating techniques measure different materials deriving from different events and processes, incorporate different assumptions, and ultimately may not be directly comparable. If on the one hand, environmental sequences, be they pollen (e.g., Langgut et al. 2014), speleothem isotopes (e.g., Bar-Matthews and Ayalon 2011), or geomorphological (e.g., Bookman et al. 2004), etc. are usually dated by radiocarbon or other absolute dating techniques, sometimes with interpolated dates between the actual assays, and the samples themselves reflecting “windows” into an environment, comparisons with archaeological sequences are usually based on periodization frameworks, which tend to reduce trends to integral blocks, with little graduated change or precision. Thus, long-term trends in the environmental record may be matched up against what appear to be abrupt or rapid archaeological changes, which may not be rapid and may not match up at all.

The proxy data reflecting environmental and climatic change may have different reaction times to underlying environmental causes. Lake levels, as reflected in geomorphological sections and cores, may react more quickly to rainfall fluctuations than plant successions, reflected in pollen diagrams. And of course, pollen spectra may reflect relict floras, or long-distance transport, with little meaning in terms of fluctuating climates (e.g., Enzel et al. 2008). Goodfriend (1988, 1991) demonstrated shifts in desert margins based on changing carbon isotope ratios in land snail shells, but in fact we have little data on how long shrubs require to colonize new geographic zones (or withdraw from them), and in a way which might be reflected in the isotopic signatures of the snails feeding on them. Within lake cores, dates are usually calibrated by linear interpolation between generally scarce radiocarbon dates, essentially assuming a constant sedimentation rate. Yet, the very existence of climatic change within such an interpolated period may be indicative of changing run-off patterns and sedimentation rates, rendering such interpolations unrealistic. In short, the mere dating of climatic events is an issue which requires critical examination.

Defining climatic events can also be problematic. Sometimes this may be the result of out-of-phase dates, such that one set of data suggests one set of climatic conditions, while another suggests a different set. In other situations, lack of data may require reference to adjacent regions. This too may be fraught with difficulties. Avner (2002:131–132) cites Arabian and Saharan pluvial lakes as evidence for a Negev Neolithic wet phase. However, such data can be used only cautiously; the Arabian Peninsula is subject to the effects of Indian Ocean monsoon systems, and a climatic change caused by a minor northward shift of these monsoons significantly affecting Arabia might not be felt at all in the

Negev. Similarly, the Saharan lakes were fed both by sub-Saharan as well as Mediterranean systems (Drake et al. 2011). Although in general southern Levantine climates are controlled by European and continental systems (e.g., Robinson et al. 2006), in their review of late Pleistocene climate systems Enzel et al. (2008) conclude that the southern Mediterranean coast of Sinai dictated the basic climate structures influencing late Pleistocene and Holocene rainfall patterns in the southern deserts, structurally ensuring a steep rainfall gradient from north to south. That is, rainfall variability in central and northern Israel should not be expected to correlate in a linear fashion with rainfall in the south; the central and southern Negev and Sinai during the Holocene were always fundamentally dry. Notably, the Badia in eastern Jordan would not have been affected by the structure of the southern coast, and perhaps *was* more influenced by Mediterranean climatic patterns.

Finally, the interpretation of proxy data is never obvious. Briefly stated, proxy data require processual understanding of environmental phenomena. In reality, there are no proxy data which reflect “wet”. Thus, $\delta^{18}\text{O}$ fluctuations in speleothems reflect a combination of changes in drainage patterns, soil cover, vegetation cover, rainfall, bedrock weathering, and rainfall isotope composition. The reduction to a single variable, rainfall (e.g., Bar-Matthews and Ayalon 2004), as convenient and conceptually useful as it is, is an interpretation based on complex calculations and extrapolations from modern climates, not a direct measurement.

Beyond the problems of defining climatic and environmental events, when attempting to deal with the relationship between climate, environment, and society, the most difficult issues may be those concerning society. Although there is a tendency to see societies and cultures in a kind of rise-and-fall pattern (cf. Butzer 1980), and especially to tie perceived collapses to periods of climatic or environmental deterioration (read dry periods for the Near East), such “collapse” characterizations are usually too simplistic to permit real explanation (e.g., A. Rosen 2007; Yoffee and Cowgill 1991). Archaeological trends or occurrences are often reduced to period characterizations (e.g., collapse at the end of the Late Bronze Age) when in fact the trends occurred over a long period, rendering correlation with environmental sequences more difficult. Societies are not monolithic and some events and trends may affect different components of a society differentially. Finally, adjustments to environmental or climatic fluctuation may also be nuanced, such that teasing out the social changes and interpreting them convincingly as responses to environmental variation is at best a complex task (e.g., Butzer 1982; A. Rosen 2007; Rosen and Rosen 2003).

Although the interpretation of the effects these changes had on the origins and development of pastoral nomadic societies will be discussed in the context

of each specific case study, the simplistic notions often attendant on climate-culture correlations need to be addressed. For the purposes of this study, cultures and societies interact with environment, adjusting in different ways to different environmental stimuli, and different intensities of these stimuli. Even if a causal relationship between a climatic fluctuation and a cultural change is accepted, the process of change must be placed in a larger social and historical context which in some way explains the reason for that particular social or cultural response. One-to-one correspondences between proxy data and culture change are not explanatory.

The Early Holocene

Climate in the 8th millennium BCE in the arid and semi-arid regions is considered by most researchers to have been wetter than today (e.g., Goring-Morris 1993; Horowitz 1976, 1977), resulting in the expansion of the Mediterranean and Irano-Turanian (steppe) zones, at the expense of the Saharo-Arabian zone (e.g., Cordova 2007:171–173). Aside from changes in plant assemblage composition, such changes would have increased vegetation cover as well, with attendant changes in faunal compositions and densities. Water sources also became more common and reliable, as seen in some places in permanent or seasonal lakes and higher aquifers.

The evidence for these changes derives from several sources. Pollen data recovered from the Pre-Pottery Neolithic B site D1 in the Central Negev show 8% arboreal pollen, considerably more than modern frequencies, with the presence of olive, almond, and pine arboreal (Horowitz 1977:249). Although these pollen types are present in only low frequencies, their mere presence is significant since they represent genera which no longer exist in these regions. Pollen data from the PPNB of South Sinai (Bar-Yosef 1981a:226) also indicate greater arboreal pollen in this period.

In general, increased rainfall is also suggested from pollen analyses conducted at sites beyond the deserts, although these can inform only indirectly, and are very much the subject of chronological debate. Thus, Rossignol-Strick (1995) sees the rise in arboreal pollen from the cores in the Huleh Basin of northern Israel and the Ghab Basin in Syria (e.g., van Zeist and Woldring 1978), most notably oak, pistachio, and olive, as occurring in the Early Holocene (see Rosen 2007; Wright and Thorpe 2003 for summary and arguments supporting the spread of forests in the Bølling/Allerød period ca. 14,700 to 12,700 BP). The pollen data derived from sites in western Turkey indicate a rapid return to moist conditions and dominance of arboreal pollen in

the Early Holocene; other diagrams from farther east may suggest a slower recovery, perhaps the result of higher altitudes (Eastwood et al. 1999; Kuzucuoglu et al. 1999; Wick et al. 2003), or human management practices (Roberts 2002). Closer to the Negev, the Ein Gedi core (Litt et al. 2012), dated by organic relicts (and therefore without the flaws of the lake core chronologies), also shows relatively high arboreal pollen in the Early Holocene followed by a gap ca. 6000 BCE, and generally lower arboreal pollen in the Middle Holocene.

Liphschitz (1986) has also identified olive and cypress charcoal fragments from PPNB Negev Highland sites, a similar picture to that obtained from the pollen. As with the pollen, some of this may reflect relict vegetation, but *Olea* was not identified amongst thousands of samples collected from late Epipaleolithic sites in the Negev Highlands, suggesting that olives were not relicts and indeed colonized the region during the Early Holocene. Danin's (1985) study of lichen growth on limestone associated with Neolithic sites and weathering patterns also suggests a PPNB wet phase, although dating of his materials is loose. Avner (1998) interprets these data to indicate that the Negev Highlands received on the order of 200 mm of rainfall per annum, 25%–50% greater than today. Notably, these studies refer to the Negev Highlands and not areas farther south.

In Jordan, wild and domestic barley, einkorn, and domestic emmer were found in Pre-Pottery Neolithic B sites in Azraq (Garrard et al. 1994b). This is well beyond both their natural distribution, as well as the modern rainfall distribution which would allow their cultivation without irrigation.

Servello (1976:351–353) notes the presence of *Dama mesopotamica* (Persian fallow deer) and *Bos primigenius* (wild cattle) at PPNB Sde Divshon, in the Central Negev. These occurrences are well south of their later distributions, and both animals require far greater vegetation cover than is present in the region today. Similarly, *Bos* was found in PPNB sites in South Sinai (Bar-Yosef 1984).

Analysis of Dead Sea sediments (e.g., Bookman et al. 2006; Frumkin et al. 1991; Migowski et al. 2006; Neev and Emery 1995; Neev and Hall 1977) indicates high lake levels in the 8th millennium BCE, declining only ca. 6500–6000 BCE. Working in the Jordan Valley, Goldberg (1994) notes the presence of silt deposition coinciding with and post-dating the Pre-Pottery Neolithic A site of Salibiya, in essence dating the high water table to the (early) Pre-Pottery Neolithic B as well. Sedimentological studies by Hourani and Courty (1997), also working in the Jordan Valley, indicate warm and humid conditions ca. 9500–7000 BCE.

Early Holocene deposits from Wadi ath-Thamad and Wadi Ar-Riwaq, in Jordan, (Cordova 2000) show an upper terrace derived from colluvial deposits

dated in the upper levels to 7055–6600 BCE. In Wadi Faynan, Hunt et al. (2004) characterize an Early Holocene alluvial deposit as meandering stream depositional environments. Pollen analysis suggests a steppic zone, the margins of the Mediterranean forest, moister than today's arid climate. Similarly, Schuldenrein and Goldberg (1981) note sediment aggradation and spring deposits dated to the Early Holocene.

Isotope studies of cave speleothems from Central Israel (Bar-Matthews et al. 1998, 1999) show decreases in $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ following the Younger Dryas, in the Early Holocene, reflecting warmer and wetter conditions. Geyh's (1994) analysis of speleothem accretion, a function of increased run-off, suggests increased stalagmite formation ca. 8500–5500 BCE, indicating a "Neolithic Pluvial", and according well with a PPNB wet phase. If these studies are somewhat far afield in terms of the reconstruction of Early Holocene environments in the arid zones, in the Negev $\delta^{13}\text{C}$ isotopic analysis of land snail shells, reflecting snail diets of C3 or C4 vegetation, indicates greater C3 vegetation than present today. The $\delta^{18}\text{O}$ analyses from the same shells indicated greater rainfall, in accord with the C3 vegetation (Goodfriend 1988, 1999; Magaritz and Goodfriend 1987).

Farther afield, El-Moslimany (1994) summarizes the evidence for Early Holocene summer precipitation in the Near East. Of especial interest is the existence of Arabian fossil lakes, whose dates cluster from ca. 7250–6000 BCE, overlapping with a Levantine PPNB wet phase. However, it is unclear whether the Indian Ocean summer monsoon system which seems to have fed these lakes ever advanced far enough north or west to affect the southern Levantine deserts.

The dates of the events reflected in the various realms of evidence are not in perfect accord. There is much variation in dating both the beginning as well as at the end of the PPNB wet phase. In spite of these difficulties, it is noteworthy that all of the dates for a wetter phase overlap in the late 8th millennium BCE, the Late Pre-Pottery Neolithic B (LPPNB). Briefly summing these materials, in the Early Holocene the desert regions were variably wetter than present day. In eastern Jordan, in a richer steppe than today, it is likely that rainfall was sufficient to carry out opportunistic agriculture, and that seasonal lakes facilitated hunting and later herding. The highlands of the Central Negev mitigated the steep rainfall gradient such that rainfall increased enough to effect a southward shift of the steppe zone. In the Southern Negev, amelioration was probably evident only in specific microenvironments, such as the Uvda Valley, where run-off is evident in aggrading alluvial fans in this period (e.g., Avner 1990; Goring-Morris and Gopher 1983). South Sinai also seems to have been somewhat wetter, like the Central Negev presumably influenced by its high altitude.

Although it is clear that the climatic optimum of the Pre-Pottery Neolithic B ended sometime following that period, it is not clear precisely when. While the apparent collapse of PPNB society (e.g., Kuijt and Goring-Morris 2002) has often been attributed to a major arid episode (e.g. Moore 1973; Perrot 1968; Rollefson and Köhler-Rollefson 1989; Weninger et al. 2009), if one is to establish a causal relationship between social change and environment, it is important to evaluate the evidence for climatic change independently of the social changes.

Rossignol-Strick's (1995) synthesis of marine and terrestrial pollen data from the eastern Mediterranean and Near East extends the PPNB wet phase, her "*pistacia* phase", to as late as 5000 BCE, i.e., deep within the Pottery Neolithic (Late Neolithic), but nevertheless ending at this time. In some agreement, Horowitz (1979:232–233, Table 6.11 for Hula Lake) interprets his Sea of Galilee pollen data to indicate the drying out of the marshes in the mid-Holocene. In contrast to the preceding PPNB, archaeological pollen data from desert sites are absent due to a relative scarcity of Pottery Neolithic archaeological sites in the desert zones, and an even greater scarcity of excavated sites. Geyh's (1994) analysis of speleothem accretion also suggests a decrease in run-off ca. 5500 BCE, and Goodfriend et al. (1986) suggest a high stand of the Dead Sea ca. 6000–5500 BCE, based on analysis of a reconstructed splash zone. This seems to correspond roughly with Goodfriend's (1990) stable carbon isotope data derived from land snail shells, suggesting a southerly shift of rainfall isohyets ca. 5200 BCE; that is, any increase in aridity would have to post-date 5200 BCE.

These late dates for the beginning of a drier episode are disputed by Frumkin et al. (1991, 1998), whose geomorphological data suggest a precipitous decline in high Dead Sea levels beginning ca. 6500 BCE. In the Jordan Valley, Schuldenrein and Goldberg (1981) suggest that an erosional episode followed the earlier silt deposition of the PPNB. Hourani and Courty (1997) view the period from 7000 to 5500 BCE as one of erosion and climatic instability.

Speleothem isotope data provide an important clue to deciphering this apparent confusion of dates. Within the Neolithic wet phase, Bar-Matthews and Ayalon 2004, 2011; Bar-Matthews et al. (1998, 1999) data show a sharp decline in $\delta^{13}\text{C}$ corresponding to a less sharp increase in $\delta^{18}\text{O}$ ca. 8100 BP, interpreted as a relatively short, dry event. Another precipitous decline in $\delta^{13}\text{C}$ with an increase in $\delta^{18}\text{O}$ occurred ca. 5000 BP. Bar-Matthews and Ayalon (2004) translated these data to a rainfall sequence (Fig. 5.5) such that the first dry event corresponds more or less to the end of the PPNC and beginning of the

Pottery Neolithic. It is followed by a resumption of relatively moist conditions, followed by a climatic regime roughly similar to that of the present.

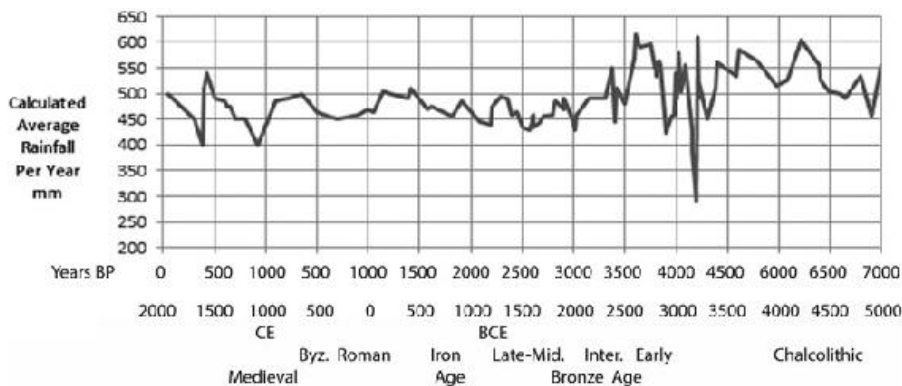


Figure 5.5 Holocene rainfall sequence based on stable carbon and oxygen isotopes from the Soreq Cave, redrawn from Bar-Matthews and Ayalon (2004) with archaeological periods and calendric dates BP and CE/BCE.

Thus, the Pottery Neolithic (the Early Timnian and perhaps the Tuwailan in the Negev culture sequence) seems to have been ushered in by a short dry snap, but followed afterwards by a return to the earlier moist conditions. Modern drier conditions seem to have begun sometime in the late 6th or early 5th millennium BCE (with a wet episode in the latter part of that millennium).

The Chalcolithic Period/Middle Timnian

As with the Pre-Pottery Neolithic B, there seems to be a scholarly consensus that the Chalcolithic period was wet. However, more detailed review suggests that although there was a wet episode, it is not clear that the entire period can be characterized as such.

Beginning with the pollen data, the base of the Kinneret (Sea of Galilee) diagram (Baruch 1986), dated to 5350 BP uncalibrated (ca. 4100 BCE), shows a high level of arboreal pollen. The Hula core analyzed by Tsukada (van Zeist and Bottema 1982) is in substantial agreement. Although Baruch (1986) indicates the possibility of anthropogenic factors playing a role here, perhaps the beginning of olive cultivation, there is little additional evidence of massive olive cultivation in the Chalcolithic period, unlike later times. The causes of the arboreal pollen increase are likely increased precipitation, although not of the order seen in the PPNB. In the Central Negev, two Chalcolithic sites in Nahal Zin showed low percentages of arboreal pollen, identifiable as olive, oak, pine, juniper, and almond (Horowitz 1976:66, 1979:248). These species are no longer

extant in the Negev.

Increased alluviation has been noted at several locales, and has been taken to indicate increased rainfall. Most notably, wadi sections adjacent to the Chalcolithic site of Shiqmim (Goldberg 1987; Goldberg and Rosen 1987) show inter-fingering of alluvial sediments and site deposits. Schuldenrein and Goldberg (1981) have also noted Chalcolithic alluviation in the Jordan valley, followed by undated post-Chalcolithic erosion.

Based on sedimentological and geomorphological analyses, Frumkin et al. (1991) and Neev and his co-workers (Neev and Emery 1995; Neev and Hall 1977) concur that by ca. 3000 BCE the Dead Sea level was high, indicating increased run-off and implying increased rainfall. Based on studies of salt cave width and driftwood dates, Frumkin et al. (1991, 1994) suggest a somewhat earlier date for the beginning of this episode. Goodfriend (1990) concluded that rainfall isohyets were 20 km south of their present-day locations ca. 4800 BP uncalibrated (ca. 3500 BCE), based on stable carbon isotope analyses of land snail shells. Given problems of dating precision, it is difficult to know whether this date does not reflect either the earlier Chalcolithic wet episode, the later Early Bronze Age wet phase, or some other spike in humidity.

Bar-Matthews and Ayalon's (2004, 2011) reconstruction of the climatic sequence based on isotope analyses of cave speleothems provides the most detailed record of rainfall fluctuations for the period. Although in accord with the above studies in indicating a generally wetter climate in the Chalcolithic, the isotope data suggest important fluctuations within the period as well. Beyond the transition from the dry terminal Pottery Neolithic (ca. 7000 BCE), the period shows three rainfall peaks separated by two relatively shallow troughs. Significantly, the troughs in the Chalcolithic are as high as rainfall peaks in later periods.

The Bronze Age (Late Timnian, Terminal Timnian, and Second Millennium BCE)

Pollen data from the Kinneret I core in the Sea of Galilee (Baruch 1986) reflect medium levels of arboreal pollen in the Bronze Age, with some fluctuations. In particular, Baruch notes that an oak forest far denser than the present day existed around the Sea of Galilee in the second half of the 4th millennium BCE. The increase in olive pollen in the 3rd millennium BCE may reflect cultivation associated with Early Bronze Age urban civilization. In fact, from the Early Bronze Age, the use of pollen diagrams for reconstructing climatic history becomes increasingly difficult due to ever greater and more intensive

human influences on the vegetational regimes. For Baruch (1986), land clearance, cereal agriculture, and olive cultivation have been primary factors in vegetation change as reflected in pollen diagrams over the past four millennia.

Analyses of fluvial terrace systems in the northern Negev (A. Rosen 1986a, 1986b, 1991) suggest Early Bronze Age alluviation, possibly a continuation of the earlier Chalcolithic regime, but clearly dating to the Early Bronze Age on the basis of pottery sherds found in situ in the alluvial sections. Alluviation ceased ca. 2000 BCE, shifting to an erosional regime through at least the following millennium.

The cave speleothem isotope data show numerous relatively large-scale fluctuations throughout the Bronze Age. The Early Bronze Age in particular seems to show two early rainfall spikes and declines, followed by a somewhat longer wet episode in the middle of the 3rd millennium BCE, and a significant decline to modern rainfall parameters at the end of the Early Bronze Age (Bar-Matthews and Ayalon 2004, 2011), the 4.2ky event (before present). These conclusions accord with isotope data from the Sea of Galilee indicating a cool and moist interval 3100–2000 BCE followed by a warmer and dryer period beginning ca. 2000 BCE (Stiller et al. 1984). The 2nd millennium BCE shows both a lower level of precipitation and less marked fluctuations.

Frumkin's et al. (1991, 1994) analyses of Mt. Sedom (Dead Sea) cave-width ratios and driftwood remains found in these passages indicate high Dead Sea levels in the Early Bronze Age (also Migowski et al. 2006; Neev and Emery 1995; Neev and Hall 1977), with a rapid drop-off toward the end of the 3rd millennium BCE. The lower lake levels continued through the end of the 2nd millennium BCE, although Migowski et al. (2006) conclude that the reduction in lake levels occurred in the late 2nd millennium BCE. Goodfriend's (1988, 1990, 1991) snail isotope data reflect a roughly similar picture, such that a dry period followed the Chalcolithic/Early Bronze Age rainfall peak. He also records a final southward shift of isohyets at the end of the 2nd millennium BCE, roughly the end of the (Late) Bronze Age.

The First Millennium BCE

This chronological span corresponds roughly to the Iron Age and early Classical Era, although to be precise, the Iron Age begins ca. 1200 BCE. The issue of precision is important. As noted above, both the Dead Sea lake level data (Frumkin et al. 1991, 1994), the snail shell isotope data (Goodfriend 1990), and pollen analyses from the Dead Sea (Langgut et al. 2014) suggest a wetter phase in the Late Bronze Age, followed by a dryer Iron Age. However, Bar-

Matthews and Ayalon's (2004, 2011) speleothem analyses date what must be the same wetter phase well into the Iron Age. For paleoclimatology this issue of 200 years is of little significance, but for studies of historical causality, it is, of course, crucial. The discrepancy cannot be resolved at present, but two points are important to note. First, regardless of the dates, according to the speleothem data, the amplitude of the climatic changes is of a lesser order than, for example, that of the 4.2ky event. Second, although various scholars (e.g., Bar-Matthews and Ayalon 2011; Issar 1998; Langgut et al. 2014) have linked this climatic change to the "collapse" of Late Bronze civilization, the beginning of the Iron Age, and, by default, the origins of the Israelites, the social history is very complex and does not line up according to the neat periods of the chronological shorthand used for correlating culture and climatic change.

Beyond the high lake levels of the late 2nd millennium BCE, the Dead Sea remained low for most of the 1st millennium BCE, only rising again ca. 200 BCE (Frumkin et al. 1991). This is also reflected in the run-off hydrology studies in the eastern Negev (Frumkin et al. 1998). Bookman et al. (2004) also note a high stand of the Dead Sea in the general period of the 1st centuries BCE–CE. In general, the existence of a increased wetness in this period is in rough agreement with the cave isotope data, although Bar-Matthews and Ayalon (2004, 2011) place the episode somewhat earlier. A similar picture obtains from the pollen data, but the dominance of olive probably reflects classical period cultivation and not climatic change (Baruch 1986), although a minor peak in oak may reflect somewhat moister conditions (Litt et al. 2012).

The First Millennium CE

According to the isotope data from cave speleothems (Bar-Matthews and Ayalon 2004, 2011), following the rainfall peak at the end of the 1st millennium BCE, the bulk of the Roman-Byzantine period in the first half of the 1st millennium CE can be characterized as a period of relatively low rainfall. A trend toward increased rainfall can be detected in the Early Islamic period, around the 7–8th centuries CE.

Dead Sea lake levels and hydrological analysis (Bookman et al. 2004; Frumkin et al. 1991) are roughly similar in structure, but extend the wet episode at the end of the 1st millennium BCE well into the 1st millennium CE. The middle of the 1st millennium CE is characterized by low Dead Sea levels, reflecting an arid episode, similar to the speleothem data. The end of this millennium shows another rise in lake level.

Several scholars have noted a major period of alluviation during the classical era (e.g., Bruins 1986:189; Goldberg 1986; A. Rosen 2007:95–96; and more generally in the Mediterranean Basin, Bintliff 1975; Vita Finzi 1969; Wagstaff 1981). However, precision dating of this alluvium has been lacking, and it cannot be assigned specifically to either the early or the late rainfall peak, as indicated by the lake levels and isotope data. Furthermore, alluviation, and its erosional complement, are much affected by such processes as land clearance and terracing. It is not clear how much of this “Younger Fill” (Vita Finzi 1969) was induced by human activity. Certainly, in the Negev, the construction of terraced fields has resulted in “artificial” alluviation since at least Hellenistic times, if not earlier (e.g., Avni et al. 2012; Bruins 2012).

These terraces are later incised in an erosional episode. The presence of cut archaeological structures dating to the Early Islamic Period at the site of Nahal Oded in the Central Negev (Ben-David 1997) suggests that this erosional episode post-dates the Early Islamic period. Furthermore, the absence of agricultural exploitation in that area of the Negev strongly suggests that the erosion was climatically induced.

The Implications of Climatic Fluctuations

The climatic sequence reviewed above, for all its complexities in terms of reconstruction and precision, still provides a basic framework for trying to understand some of the changing human adaptations to the desert. However, the sequence as presented is, in fact, little more than a set of alternating wet and dry phases of varying length. Although the climatic reconstructions themselves do encode the intensity of the fluctuations, in attempts to correlate culture and climate, little attention has been paid to this crucial element of degree of change.

Furthermore, the primary factors affecting human settlement are in reality not climatic, but environmental, comprised of the effects that climate change had on environment. Issues such as degree and type of vegetation cover, presence of springs and running water, and in what quantities, basic hydrological questions such as type of flooding, soil erosion, and terrace aggregation, type and degree of soil development, and deriving from these, such factors as type and quantity of animal populations and agricultural potential, are the true factors behind the presence of human settlement and its character. Crudely reconstructed, wet phases can be seen in the expansion southward and eastward of the Mediterranean zone, with a corresponding

movement of the Irano-Turanian steppe zone, and the resulting contraction of the Saharo-Arabian desert zone. Within each of these zones, one can also expect variability due to the not-insignificant role of microenvironments.

No less important for understanding human reaction to these changes is the existence of specific environmental and technological thresholds. The most obvious of these are the dry farming thresholds of 300 mm of rainfall per year for wheat and 200 mm for barley (e.g., Grigg 1974, who sets the wheat threshold at 250 mm/year). That is, south of the Beersheva Basin, or east of Amman, dry farming based only on rainfall is not possible. For rainfall run-off irrigation systems, as in the Negev (e.g., Evenari et al. 1982:95–119), 50 mm of rainfall per year constitutes a minimum for growing, but this appears to have been inadequate as a primary subsistence mode in these regions, and there are no run-off irrigation systems below roughly the 100 mm per year isohyet, not surprisingly corresponding to the southern edge of the Irano-Turanian steppe zone (Fig. 5.4).

To judge from site distribution maps (e.g., Rosen 2009), for sheep/goat pastoralists, a 75 mm of rainfall per year threshold seems to reflect the minimum necessary for seasonal pasturage, although movement through drier zones to territories of higher rainfall is obviously possible. Different species of animals, and different variants within species, have different requirements. Camels are far more tolerant of aridity than sheep or goats, and goats more tolerant than sheep. Cattle seem never to have been raised in the Central Negev. As a parallel case, for example, Behnke (1980) showed different exploitation zones for different animals in Cyrenaica, cattle in the northern, better watered areas, sheep farther south, then goats and finally camels in the arid desert. Temperature, little reflected in the climatic reconstructions, also may play a role in animal adaptation so that the sheltering of goats in rock shelters in the Negev winters reflects their sensitivity to the cold nights.

Pastoral zonation is not dictated by environmental and climatic factors alone. In the Negev, these zones have shifted north and south, sometimes on the order of over 100 km, depending on political and economic circumstances (Rosen 2009). During the early periods of the development of desert pastoralism, Timnian habitation sites are found up to the northern Negev; by Byzantine times, with the expansion of the urban and agricultural periphery deep into the desert (based on run-off irrigation), the center of gravity of the pastoral systems clearly shifted to the *Makhtesh* Ramon and south.

Finally, technologies as well as social and economic structures can also enhance environmental adaptation. Besides the obvious, such as desert irrigation technologies, the construction of cisterns and wells, the introduction of better adapted species, the greater proximity of markets, etc. all affect human abilities to adapt to changing desert environments.

Note

- 1 Although Juli (1979), the excavator, claims these sites to be Chalcolithic, his ceramic illustrations suggest that they may, in fact, be Early Bronze Age in date.

The Pre-Pottery Neolithic B Baseline

The Last Hunter-Gatherers in the Desert

Goats in the Pre-Pottery Neolithic B Heartland

In early conceptions of the rise of civilization, pastoral nomadic societies were perceived as intermediate between the most primitive culture-evolutionary stage of hunting-gathering and more advanced village-farming and, later, urban civilization. In his early synthesis of the Neolithic Revolution, V.G. Childe (e.g., 1951:59–86) adapted this framework to his own theoretical approach, retaining the hunter-gatherer-to-herder-to-farmer-to-city-dweller sequence, suggesting that farming developed as a by-product of the need to support herds; these were domesticated as a natural consequence of the propinquity between humans and animals as they were forced to concentrate around water sources (oases) following the great (perceived) desiccation after the last glacial pluvial.

The overall critique of Childe's climatic determinist conception of the rise of agriculture aside (e.g., Braidwood 1967:90–91),¹ archaeological excavations throughout the Near East have demonstrated repeatedly that the sequence itself is incorrect. Village farming, or perhaps better, village life based on incipient farming and intensive foraging on the way to becoming full-fledged agriculture, clearly preceded the domestication of the goat, the earliest herd domesticate (wolves having been domesticated into dogs significantly earlier, following a different set of social processes). These earliest villagers, dating to the Pre-Pottery Neolithic A (PPNA) and early Pre-Pottery Neolithic B (PPNB), were farmer-hunters.² This ought not to seem such a strange conception (e.g., Kent 1989). The maize-farmer-hunters of North American chiefdoms, tribes, and confederations prior to the demographic collapse consequent to European contact are well-established examples of farmer-hunters; nevertheless, given early Eurocentric conceptions of the Neolithic as a package consisting of

agriculture, pottery, and ground stone tools, along with domestic animals, the idea of a Pre-Pottery Neolithic without domesticated animals was something new for Near Eastern archaeology in the mid 20th century when Kenyon (e.g., 1957) coined the term. In the Levant, late Epipaleolithic Natufians and PPNA/early PPNB peoples were expert gazelle hunters, and faunal assemblages are dominated by gazelle, usually between 60% and 80% of any collection (e.g., Davis 1982; Horwitz et al. 1999). *Capra* bones are rare at best from these periods, although not absent.

In the Levant, this picture is reversed by the Middle PPNB, beginning at the end of the 9th millennium BCE, when *Capra* dominates most but not all faunal assemblages from the village sites of the region (cf. Horwitz 2003a). This transition from gazelle to goats is taken by virtual scholarly consensus (Davis 1982; Garrard et al. 1996; Horwitz et al. 1999; Kuijt and Goring-Morris 2002; Martin 1999) to indicate a basic change in meat acquisition strategies, from hunting (of wild gazelle) to herding (of domestic goats). Several points require further discussion.

The identification of the *Capra* assemblages as domestic is based on the presence of some, but not many, twisted horn cores, hints of changing culling patterns, and mostly, the rapid replacement of a clearly hunted species, gazelle, by a species, goats, which a phase or two later is clearly morphologically domestic, implying an earlier phase of domestication behaviors prior to the morphological changes (especially Peters et al. 1999, special edition of *Paléorient*). Horwitz (2003a) has noted that not all PPNB sites show this replacement contemporaneously, and she suggests that the adoption of herding was a patchwork or mosaic affair.

In Davis' (1982) early synthesis of the PPNB faunas, he suggested that the rapid replacement of gazelle indicated the introduction of domestic goats, as opposed to their in situ domestication in the Southern Levant (cf. Martin and Edwards 2013; also Horwitz et al. 1999). Given the now-recognized presence (although not abundance) of *Capra aegagrus* (the wild progenitor of *Capra hircus* or *Capra aegagrus hircus*, the domestic goat) in the southern Levant prior to the PPNB, something not really evident when Davis was writing, and the variability in the patterns of adoption and exploitation of goats in the course of the 9th and 8th millennia, Martin and Edwards (2013) have suggested at least the possibility of in situ domestication processes in the region. The absence of a high-resolution chronology constitutes a difficult problem here. The Middle PPNB, when goats first appear in any numbers in the Southern Levant, spans half a millennium or longer (Kuijt and Goring-Morris 2002), beginning as early as 8000 BCE. Although a very rapid introduction over a broad area would suggest introduction and adoption, and a more gradual transition, with graded percentages of goats in the assemblages, would argue

for in situ development, the data do not yet allow such distinctions. Regardless, as in situ domestication of the goat has been well demonstrated at the site of Tepe Ganj Dareh, in Iran (Hesse 1982; Zeder and Hesse 2000), and dated to the second half of the 9th millennium BCE, clearly earlier than their adoption in the Southern Levant (Martin and Edwards 2013), if domestic goats were adopted into the southern Levant, then the diffusion process was very rapid. Assuming for heuristic purposes a source area around Tepe Ganj Dareh, then the goat herding adaptation would have had to traverse a distance of some 1000 km in perhaps 300 years, a very rapid diffusion over a long distance, given that it is not merely the movement of objects, but a fundamental change in lifeways. Of course, if the source area was closer, and wild goats are indeed present in PPNA assemblages in Syria and Lebanon in larger numbers than in Israel, Palestine, and Jordan, then the problem is of a lesser order, especially given the well-established diffusion connections between the northern and southern Levant (e.g., Bar-Yosef and Belfer-Cohen 1989; Gopher 1989a, b). Nevertheless, the shift from hunting goats to herding them is a major change (Fig. 6.1 for site and area locations).

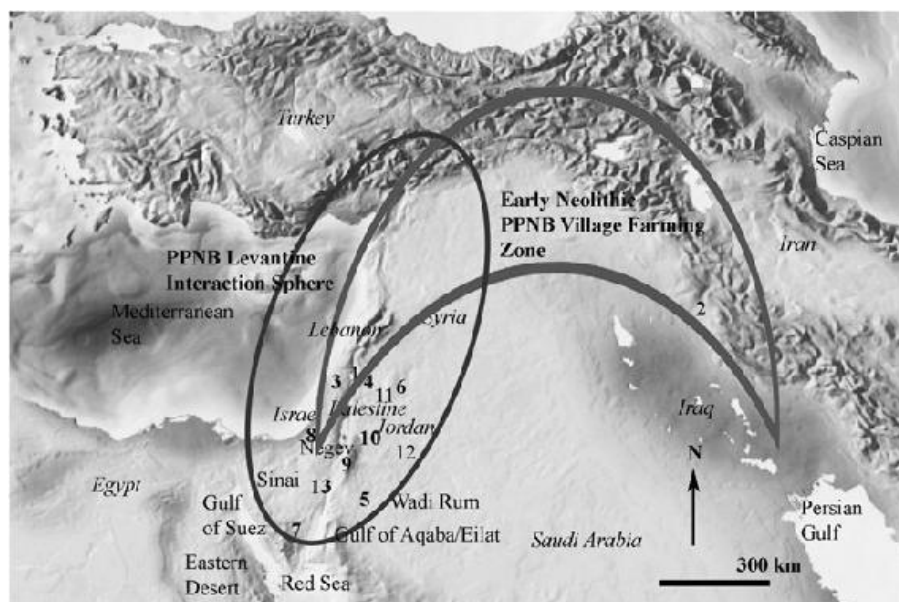


Figure 6.1 Map showing sites and areas mentioned in chapter. 1. Ohalo II, 2. Tepe Ganj Dareh, 3. Yiftahel, 4. Wadi Ziqlab, 5. Ain Abu Nukhayla, 6. Azraq, 7. Abu Maadi I, Ujrat el Mehed, Wadi Tbeik, 8. Nahal Lavan 108, 9. Beidha, Petra, 10. Wadi Hasa, 11. Jilat, 12. Ma'an Plateau, 13. Nahal Issaron (Uvda Valley).

Regardless of the issue of diffusion or in situ development, it is clear that goats were domesticated in the context of sedentary village farming. The expansion of this new adaptation (whether by diffusion or by parallel and

undoubtedly interlinked development) was rapid; it covered the entire matrix of Near Eastern PPNB *village* life within a few hundred years. Significantly, there is no evidence for major new types of site furniture or architecture to adjust for this new mode of exploitation (Effenberger 2012), but only hints of modifications of already extant features; evidently, the adoption of goats into village life did not require major *material* investment. There is a general absence of evidence for pens or other features (e.g., troughs, rock shelters with dung layers) associated with the PPNB in the core zones of village settlement (or for that matter, the peripheral zones, to be dealt with later) which might reflect herding. The apparent rapidity of the adoption of domestic goats reflects both the general homogeneity of the social matrix of the region, and the apparent relative ease with which goats could be incorporated into it, even if at some sites, as at Yiftahel, in the Galilee, gazelle hunting remained predominant (Horwitz 2003a). This all seems to suggest that our implicit models of goat herds of 40–50 head per family (the usual standard for pastoral nomadic subsistence), or more, requiring external pasturing and herding, and in the sense of extra-site herding, and explicitly based on models of recent and sub-recent Bedouin subsistence, need to be questioned (cf. Arbuckle 2014; Makarewicz 2013) and I would argue, indeed rejected.

Beyond the negative evidence in the absence of site furniture or features reflecting large scale herding (Effenberger 2012), there are other reasons to reject the “Bedouin” model. If large-scale herding of goats was really the mode of exploitation during this period, then one might expect major environmental impacts. Thus, for example, PPNB mega-sites achieved areas of 10 hectares or greater and can be assumed to have had populations of 500–1500 people, that is, perhaps 250 families (Finlayson et al. 2011; Gebel 2004; Goring-Morris and Belfer-Cohen 2008). Conservatively, this would suggest a domestic goat population of around 10,000 head (in the sense of what 40 goats will support in the “Bedouin” model). Furthermore, the occupation spans of these sites are generally several hundred years or longer. In fact, the extent of such impacts is assumed to have been so great such that Rollefson and Köhler-Rollefson (1989; Köhler-Rollefson 1992) have attributed the general PPNB collapse in part to the ravages of the black goat (Goring-Morris and Belfer-Cohen 2010; Rosen 2011b for opposing viewpoints).³ In fact, there is no evidence for such general environmental degradation during the PPNB, or even during the PPNC, when the putative survivors of the environmental catastrophe would be dealing with the consequences of collapse.

Another reason to reject any similarity to recent Bedouin adaptations lies in the nature of the exploitation of the animals. Hesse (1982; Zeder and Hesse 2000) suggests that exploitation of these earliest domestic herd animals was primarily for meat, based primarily on age culling frequencies, and on the

logic of the developmental sequence. On the other hand, Helmer et al. (2007) suggest that by the Middle PPNB, milk was systematically exploited. Certainly it is unlikely that at this early period sheep breeding would have yet resulted in the finer fleece evident in later periods and more appropriate to wool production. The question of dairying at this early stage remains a problematic issue, since clear evidence for milk production does not appear until the Late Neolithic (Evershed et al. 2008), with residue analyses on pottery indicating use of milk products. The Late Neolithic also is the earliest with the presence of ceramic churns (e.g., Gopher and Gophna 1993; Moore 1973). Evidence for intensive dairying, as seen in reduced bone calcium (Smith and Horwitz 1984), does not occur until the Early Bronze Age (also Helmer et al. 2007 for intensification of exploitation), undoubtedly reflecting human population levels; the knowledge and the technologies to engage in dairying were already present.

The faunal assemblages are, of course, difficult to evaluate in terms of absolute herd sizes. Our samples are both small in terms of site representation (how much of a site does one actually excavate?) and uncontrolled. We do not have any fix on discard behaviors; the nature of Levantine PPNB middens, if there were any, and if perhaps most bones were discarded off-site, remains unclear. Nevertheless, given 10,000 goats over hundreds of years, with an average life span of only a few years until being served up as a meal, one wonders whether there are really enough animal bone remains to support such reconstructed numbers. Putting this another way, if there are 10,000 goats at any time at site x, and the site is occupied for only 100 years (and most sites were occupied for longer spans), then there were some 200,000 goats presumably killed for food during the occupation span of the site (assuming a life span of 5 years per goat). If only 1,000 square m of the site were excavated, that is, 1% of a 10 hectare site, then one would expect a Minimum Number of Individuals statistic on the order of 2,000 goats alone from that hypothetical faunal assemblage. Without entering into the arguments of the appropriateness of MNI, faunal statistics from Neolithic sites in the Levant never reach such numbers, but are orders of magnitude smaller.⁴

It is beyond the scope of this work to attempt in whole to revise our understanding of the nature of Levantine PPNB village pastoralism. However, as the source society for the goats eventually colonizing the desert, the reduction in numbers, and the revision in our understanding of the kind of pastoralism in which PPNB farmers engaged is important. If village pastoralism in the PPNB were indeed a kind of large-scale herd system, where specialist goatherds ventured some distances seasonally with their large herds, then expansion into the desert steppes of the period, and the ultimate fission of village society into two complementary components—sedentary farmers and

desert pastoralists—would seem a natural outcome. However, the absence of PPNB herder camps in the desert and a chronological gap between the presence of domestic goats in the PPNB heartland and their presence in the desert, on the order of hundreds of years in Jordan, perhaps more than a millennium according to our best estimates, suggests that this “natural outcome” was, in fact, not what happened.

The Origins of the Negev PPNB

In contrast to the apparent ease with which goats were adopted into village life in the PPNB village heartland, perhaps paradoxically, the arid hinterlands, somewhat less arid in the PPNB but steppe at best, present a very different story. The Pre-Pottery Neolithic B foraging societies of the arid zone periphery constitute the baseline adaptation into which domestic goats and sheep (e.g., for Jordan Garrard 1998; Martin 1999; Martin and Edwards 2013; for the Negev and Sinai, Bar-Yosef and Bar-Yosef Mayer 2002; Goring-Morris 1993; Rosen 2011b) were later introduced; however, these societies did not adopt them in step with their agricultural cousins, but rather an archaeological period or more later, in the PPNC or perhaps the early stages of the Pottery Neolithic. With the possible exception of the assemblage from Ain Abu Nukhayla, in Wadi Rum in southern Jordan (Dean 2014; Henry and Beaver 2014 with papers), there is little evidence for domestic goats or sheep in the desert periphery, either in eastern Jordan (Garrard et al. 1996; Martin 1999; Martin and Edwards 2013), the Negev, or Sinai (Dayan et al. 1986; Tchernov and Bar-Yosef 1982). Nor is there any evidence for systematic agriculture, perhaps a trivial conclusion in light of the arid environment, but reflected in the virtual absence of sickle blades from desert lithic assemblages as well as identifiable cereal phytoliths,⁵ and in marked contrast to the situation in the North (e.g., Bar-Yosef 1981b: fig. 1). In spite of its general inclusion in the Levantine PPNB Interaction Sphere (Gopher 1989a, 1989b; Bar-Yosef and Belfer-Cohen 1989), reflected especially in lithic continuities and limited exchange goods such as shells (Bar-Yosef Mayer 1997, 2005), obsidian (Burian and Friedman 1988; Renfrew et al. 1966), and greenstone (Garfinkel 1987b; Wright and Garrard 2003), there are fundamental differences between the desert and the Mediterranean-zone societies in this period. Briefly stated, the desert and steppe zones show little evidence for subsistence economies based on domesticates, either plant or animal, and can generally be characterized as mobile hunter-gatherers (e.g., Bar-Yosef 1984; Goring-Morris 1993; Kuijt and

Goring-Morris 2002; Rosen 1988a and b, 2015). The presence of some cereal remains at PPNB sites in eastern Jordan, both wild and domestic wheat and barley (as well as chick peas and figs), has been interpreted as either the result of opportunistic agriculture exploiting the seasonally available water of the Azraq Basin, the exploitation of wild plants, or perhaps limited exchange—no scholars see this as systematic farming (e.g., Garrard et al. 1994a, 1994b). This contrast in subsistence economy, combined with the location of these societies at the extreme geographic periphery of the PPNB Interaction Sphere, suggests that the peoples of the desert PPNB enjoyed a great degree of social and economic autonomy relative to the more sedentary and central PPNB culture. Furthermore, material culture similarities aside, the heartland and peripheral societies contrast in essential features beyond subsistence (reviewed below).

The origins of Pre-Pottery Neolithic B society in the desert are complex. Physical anthropological analysis (Hershkovitz et al. 1994) of the human skeletons from South Sinai PPNB sites suggests an origin in the Arabian peninsula for the populations, and burials show a combination of unique aspects and features shared with the Levantine PPNB. On the other hand, in Jordan and the Negev, the proximity to the Mediterranean zone suggests colonization as a result of expansion south and east, from the core Neolithic zones of the Fertile Crescent. In part, this idea of colonization derives from the virtual absence of Pre-Pottery Neolithic A sites in the desert zones (Bar-Yosef 1981a, 1984; Garrard et al. 1996; Goring-Morris 1993), and from the material culture continuities between desert and core areas in the PPNB. Even the Sinai sites show material culture continuities and connections with the Mediterranean zone, especially in the diffusion of arrowhead paradigms (Gopher 1989a, 1989b, 1994:252–261). Notably also, in this period there is little evidence of connections to Egypt, even in South Sinai (cf. Shirai 2009), in spite of later period Egyptian presence and occasional control (e.g., Eddy and Wendorf 1999; Hoffmeier 2012; Rothenberg and Weyer 1980).

Surveys in the Negev (e.g., Avner 1990; Goring-Morris 1987; Haiman 1992a, b; Marks 1976, 1977, 1983; Rosen 1994), Sinai (e.g., Bar-Yosef 1984; Bar-Yosef and Phillips 1977; Eddy and Wendorf 1999), and desert areas in Jordan (e.g., Betts et al. 1998, 2013; Garrard et al. 1994a, 1994b; Henry 1995:345–353) have revealed the presence of dozens of Pre-Pottery Neolithic B sites in the arid zone, with a virtual absence of PPNA. Thus, in the Negev and Sinai only two sites can be attributed to the Pre-Pottery Neolithic A: Abu Maadi I in South Sinai (Gopher 1994:176) and Nahal Lavan 108 (Gopher 1994:176; Noy et al. 1981). The materials from Abu Maadi I can be considered a Sinai variant of the terminal Epipaleolithic Harifian culture, well-dated by radiocarbon analysis to the middle of the 11th millennium BCE and perhaps overlapping with the Khiamian phase of the PPNA, but not with the main Sultanian phase of PPNA

village formation (Kuijt and Goring-Morris 2002). This is supported by arrowhead seriation (Gopher 1989a, 1989b, 1994). Nahal Lavan 108 (Noy et al. 1981), while showing the el-Khiam points typical of the Pre-Pottery Neolithic A, also shows lunates, typical of the Harifian; it is also located on the seam between the Central and Northern Negev and is perhaps to be attached to some ephemeral incursion from farther north. Regardless, the numbers are clear—there was virtually no Pre-Pottery Neolithic A habitation in the Negev or Sinai; as above, a similar situation obtains for eastern Jordan.⁶ That is, a PPNA settlement gap in the desert regions implies that the source of PPNB populations must be sought elsewhere.

Even given the discrepancy in the skeletal analysis, and the possibility that the desert populations originated in different places, the source area for much of the cultural practice in the periphery is undoubtedly to be found in the Levantine Mediterranean zone. The clear lithic typological and technological continuities (e.g., Gopher 1994) between the regions (in contrast, for example, to Egypt [Shirai 2009], and the transport of shells from the Red Sea to the Mediterranean zone (Bar-Yosef Mayer 2005) and greenstones from desert to core area (Garfinkle 1987b; Wright and Garrard 2003), are good indicators of cultural connections. Gopher's (1989a, 1989b, 1994) analysis of diffusion processes, based on arrowhead seriation, radiocarbon dates, and stratigraphic sequences, demonstrates the Mediterranean zone and Northern Levant as source areas for cultural paradigms.

If some of the desert populations derived from the core zones of the PPNB, this cultural expansion then poses an interesting problem, that of the abandonment of village farming and “reversion” to hunting-gathering in the periphery. Such expansions from the Mediterranean zone into the desert and steppe can be documented for at least two preceding periods. Bar-Yosef (e.g., 2013) has noted the expansion of the Geometric Kebaran complex into the Negev and Sinai from the Mediterranean zone ca. 14,000 BCE. Similarly, Goring-Morris (1987:142, 422; Bar-Yosef 2013) has suggested that the late Natufian florescence in the Negev and Sinai, following an occupational nadir in the early Natufian, was also the result of expansion from the Natufian core in the Mediterranean zone. Of course, both of these cases comprise hunter-gatherer-to-hunter-gatherer adaptations, the primary change being adjusting to the steppe as opposed to the Mediterranean zone. Interestingly, the Geometric Kebaran expansion⁷ corresponds to the climatic amelioration following the Last Glacial Maximum, and would seem to be the consequence of the pull of resources in what would have been a richer steppe zone. In contrast, the Late Natufian expansion occurred during the Younger Dryas, a cold and dry climatic episode which saw increased mobility in the Natufian heartland, perhaps as a result of relative resource scarcity (e.g., Rosen and

Rivera-Collazo 2012). In this case, expansion into the desert zone would be a push factor, away from an area of relatively decreased or scarcer resources into a previously unexploited zone. Given the virtual absence of Early Natufian occupation in the Negev and Sinai, moving into an apparently unexploited area would seem a good strategy, even given its lesser wealth of resources (cf. Goring-Morris 1987:434, 436). Although the Late Natufian developed into the Harifan Culture (Goring-Morris 1987:438; Scott 1977), as above, there is a hiatus following this horizon.

Byrd (1992) has suggested a similar expansion for eastern Jordan. In his model, hunter-gatherers within the PPNB system migrated to the steppe as a result of increasing pressures from the expanding agricultural societies in the Mediterranean zone. These hunter-gatherers then served as the source population for the desert populations which ultimately adopted pastoralism, diverging culturally from the sedentary zone quite early in the sequence (also Baird et al. 1992). Although his model was intended to reply to Kohler-Rollefson's (1992; Rollefson and Köhler-Rollefson 1989) model of PPNB fission, where the rise of pastoral society was explained as the consequence of the movement of shepherd groups into the steppe, it suffers from a similar flaw. Just as there are no PPNB shepherd stations in the steppe, so there are no identified PPNB hunter-gatherer campsites in the Mediterranean zone.

The PPNB expansion occurred during the major climatic amelioration of the early Holocene ([Chapter 5](#)). As reviewed earlier, seasonal lakes or marshes are present in the eastern Jordan today and evident in the paleoenvironmental record and settlement systems of the Neolithic (Betts et al. 1998:2; Cordova 2007:111–112, [fig. 6.3](#); Garrard 1998), and if the Negev and Sinai do not show evidence for Neolithic standing water, as present, for example, for the Epipaleolithic (Goldberg 1986; Goring-Morris and Goldberg 1990), nevertheless, there is ample evidence from adjacent regions for increased precipitation during the PPNB, essentially rendering the desert into steppe ([Chapter 5](#)), at least for the higher and more northerly zones of the region. Obviously, this amelioration may partially explain the *ability* to subsist in a hunter-gatherer economy, offering a partial pull factor, but by itself it does not explain the expansion since unlike the previous two examples of expansion into the steppe, involving modifications of hunter-gatherer adaptations, the PPNB expansion, from the village farming matrix that had already developed, seems to imply the abandonment of agriculture.

The problem may lie in our perceptions of the attractiveness of agriculture and our preconceptions of PPNB village life. Southern Levantine PPNB society prior to the initial adoption of domestic herd animals in the MPPNB was a hunting-farming society. Even after the advent of herding, hunting continued to play a role in economy, evident in both the faunal evidence and the

abundance of arrowheads in the lithic assemblages. Bar-Yosef and Belfer-Cohen (1989) envisage hunting group mobility as one of the primary modes of paradigm diffusion in this period, and Gopher (1989a, 1989b) has linked his model of arrowhead diffusion explicitly to the diffusion of other ideas, technologies, and fashions. Groups moving south or east out of the settled zone, in search of game but also exploiting resources like green stone and shells, could ultimately have colonized the periphery, especially given the likelihood of growing populations within the settled zone, of a necessity requiring budding off given the limitations of Neolithic agricultural systems (cf. Binford 1968 for original model of demographic growth and agricultural societies; also Rosenberg 1998 for territorial pressures and sedentism). Of course agriculture itself in these earliest days was not far removed from intensive exploitation of cereals and grasses, and collection of a range of other species (cf. Rosen and Rivera-Collazo 2012). Reversion to systematic gathering in the post-PPNA/early PPNB was probably not the huge leap it would be a few millennia later.

In an environmentally ameliorated steppe periphery, making a living through hunting and gathering may not have been the difficult task it appears to be in retrospect, looking at the modern desert. If farming developed at least partially as a form of risk reduction in the face of social competition (cf. Rosenberg 1998), hunting-gathering in an environmentally enhanced periphery with lower population densities may not have comprised the contrast to primitive farming, in terms of basic subsistence, that it appears at first glance. Ethnographically and historically such “reversions” are not all that unusual. At least some of the Kalahari hunter-gatherers seem to have originated in pastoral or agricultural societies, colonizing the desert (or being driven into it) by a number of social factors (e.g., Headland and Reid 1989; Wilmsen 1989). Farther afield conceptually (as well as geographically), groups like the Metis, of Canada, developed unique hunting adaptations for as long as the bison herds lasted (e.g., Sprenger 1987), as did trappers during the colonization of western North America (e.g., Swagerty 1980). Admittedly, these latter groups existed in a larger, market-based world, but hunter-gatherer groups continued to thrive in peripheral areas up until modern times, regardless of whether their neighbors practiced agriculture; many may indeed have practiced agriculture in a previous generation and it is not hard to conceive of the kind of integration between primitive farmers and hunter-gatherers that exists between sedentary communities and mobile pastoralists today (or did until very recently). For the relatively small populations that comprised the desert PPNB, probably numbering only a few hundreds of people for the Negev and Sinai, and perhaps a similar number for eastern Jordan, the colonization of the steppe was perhaps not a serious conceptual barrier.

Subsistence in the Desert in the PPNB

The reconstruction of subsistence systems in the desert Pre-Pottery Neolithic B is dependent on both primary remains as well as indirect evidence. Analyses of faunal remains from Ujrat el Mehed and Wadi Tbeik, sites in South Sinai (Dayan et al. 1986; Tchernov and Bar-Yosef 1982), reflect the hunting of wild ungulates, especially *Capra ibex* and *Gazella*; small game, for example, *Lepus*; and the collection of slower moving species like tortoise and lizards. Domesticates are absent from these assemblages. Russell's (1988:158) suggestion that *Capra ibex* in south Sinai was misidentified, *per contra* Dayan et al. (1986), and was more likely domestic goat, was based on theoretical preconceptions and not on examination of the materials, and cannot be sustained. Martin's (1999; Martin and Edwards 2013) work on Neolithic sites in eastern Jordan indicates that domestic goats were not introduced until the PPNC (also Betts 2008; Garrard et al. 1996).

Analyses of materials from the site of Ain Abu Nukhayla (Henry and Beaver 2014) in Wadi Rum, in southern Jordan, contrasts with these other analyses. Dean's (2014) study of the faunal remains from the site concludes that domestic goats and sheep were a primary component of the subsistence system at the site, and this is ostensibly supported by the presence of spherulites and phytoliths in site sediments (Portillo and Albert 2014). However, the distinction between *Capra aegagrus* and *Capra aegagrus hircus* (wild versus domestic goats), or even *Capra ibex*, is not convincing, and the culling curves suggest a hunting pattern rather than a herding pattern. Although the presence of spherulites is interpreted to reflect dung layers or domestic ungulate dung (Portillo and Albert 2014), the quantities do not appear to be commensurate with quantities of spherulites in dung layers from known dung deposits (e.g., Shahack-Gross et al. 2003), and the conclusions are debatable. Notably, McCorriston and Ekstrom (2014) found no evidence for cereals or dung remains in their analysis of charred macrobotanical remains. Thus, there is insufficient evidence to conclude that the *Capra* recovered on the site were domestic and not hunted and wild.

Indirect evidence for the importance of hunting derives from the high numbers and proportional dominance of arrowheads in the lithic assemblages from desert Pre-Pottery Neolithic B sites (e.g., Bar-Yosef 1981b: Fig. 1; Gopher 1994:243–261). The percentages of arrowheads are consistently higher than those associated with contemporary agricultural sites in the Mediterranean zone. These contrasts are especially evident considering middle and late PPNB sites, after the introduction of domestic herds in the Mediterranean zone (Fig. 6.2). Notably, a clear decline in arrowhead percentages is also evident in the

desert following the PPNB, after the introduction of domestic herd animals in the Negev, again a reflection of the role of arrowheads in hunting and the declining role of hunting in subsistence. In this context, the use of bows and arrows in human conflict should not be discounted, but does not explain the longer-term trends of decline or geographic contrast.

Vegetal remains have rarely been recovered from desert Pre-Pottery Neolithic B contexts, primarily a problem of preservation in usually shallow sediments. Phytolith analyses (A. Rosen 1993) identified isolated wheat based on silica skeletons at Ujrat el-Mehed, in South Sinai, but the low numbers and absence of straw implies either foraging of wild wheat or trade relations rather than agriculture. Other phytoliths reflect woody plants.⁸ Portillo and Albert (2014) isolated single-celled phytoliths clearly identifiable as grasses, but their conclusions that these represent cultivated wheat are not supported by their statistical analysis,

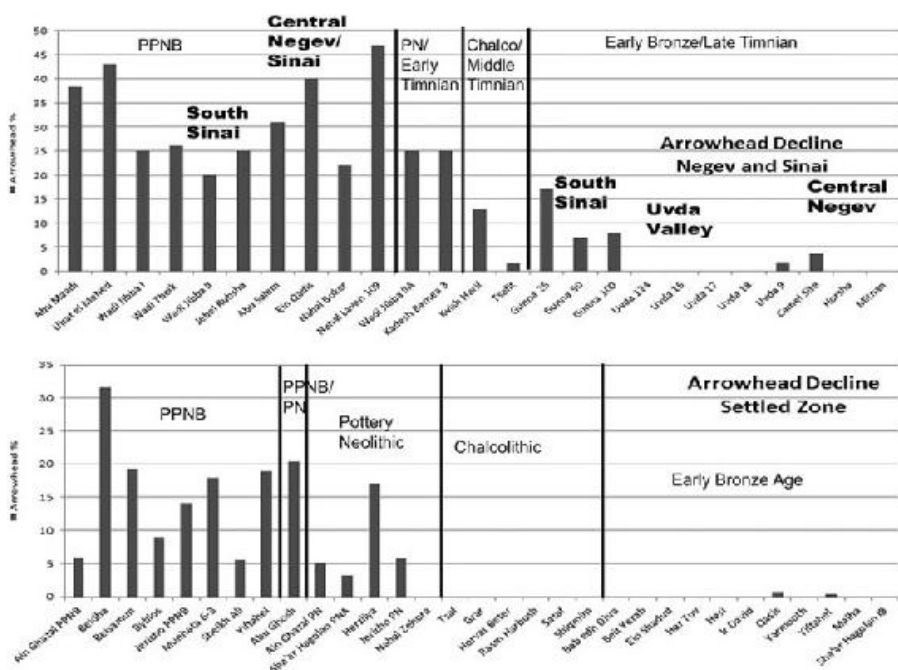


Figure 6.2 Graphs of arrowhead percentage decline, north and south. (Data from Gopher 1994; Rosen 1996, 1997). Note that x-axes are scaled differently due to different number of sites sampled per period in the north and the south. Arrowheads are generally more numerous the farther south, and they continue in regular use for two chronological stages, the Middle and Late Timnian, in the south, when they are already absent in the north in the equivalent Chalcolithic and Early Bronze Age periods. The presence of minute numbers of arrowheads at Early Bronze Age Qasis and Yiftahel is undoubtedly the result of extrusion from lower strata.

which clearly *separates* known domestic wheat phytoliths from those derived

from the archaeological contexts. McCorriston and Ekstrom (2014) found charcoal remains of a number of woody plants, some unidentifiable tubers, but no cereals. On the other hand, wheat, barley, fig, chick pea, and a range of other collected plants have been recovered from PPNB Jilat 7, indicating both gathering and perhaps opportunistic sowing (Garrard et al. 1994b). It is important to note the contrasts between the Azraq Basin (Wadi Jilat) and Wadi Rum (Ain Abu Nukhayla), with considerably greater water resources available in Azraq.

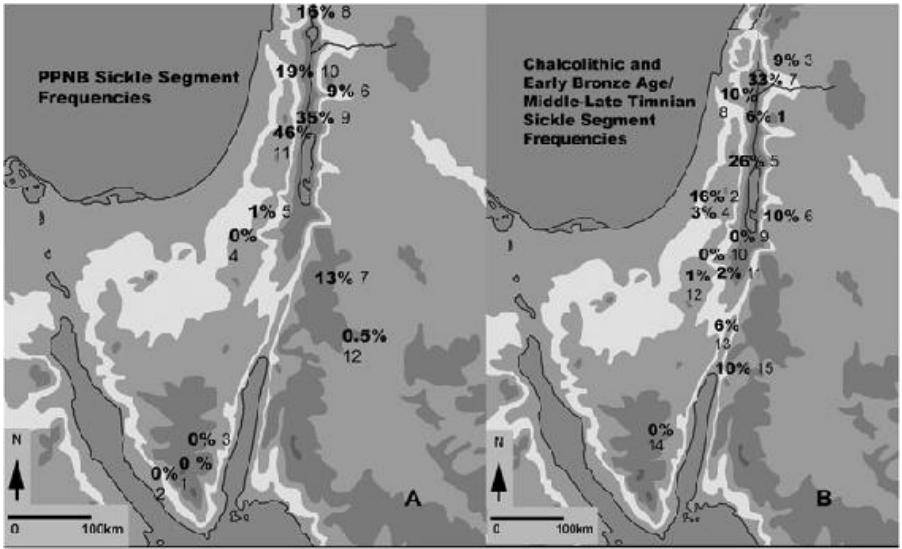


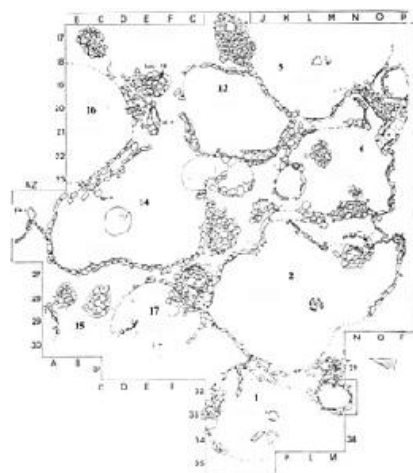
Figure 6.3 Sample sickle segment frequencies according to location. The location of the sites is indicated by **bold** percentages (not by the site number). A. PPNB: 1. Jebel Rubsha, Ujr el-Mehed, Abu Maadi (PPNB), 2. Wadi Jibba I, II, 3. Wadi Theik, 4. Ein Qadeis, Abu Salem, 5. Nahal Lavan 109, Nahal Boker, 10. Ain Ghazal (PPNB), 7. Beidha, 8. Munhatta (PPNB), 9. Jericho (PPNB), 10. Yiftahel, 11. Abu Ghosh, 12. Ayn Abu-Nukhayla. B. Chalcolithic and Early Bronze Age/Middle and Late Timnian: 1. Tel Tsaf, 2. Gar, 3. Rasm Harbush, 4. Shiqmim and Horvat Beter (average), 5. Sataf, 6. Bab ehd-Dhra, 7. Beit Yerah, 8. Ein Shadud, 9. Nahal Tsafit, 10. Kvish Harif, 11. Camel Site, 12. Nahal Mitnan, Rosh Horsha, 13. Uvda Valley sites 16, 17, 18 (average), 14. South Sinai Aradian sites, 15. Hujayrat al-Ghuzlan.

Source: Data from Gopher 1994; Gersht 2003; Rosen 1996, 1997, and specific site reports.

The presence of numerous grinding and pounding stones in virtually all such sites probably reflects plant-food processing (e.g., Kadowaki 2006; Wright 1993), but says little about which plant foods. The presence of storage pits in some PPNB sites in South Sinai and at Abu Nukhayla (Bar-Yosef 1984; Beaver 2014), perhaps silos, also implies the collection and storage of plant materials. The total absence of sickle blades in Sinai and Negev sites, contrasting with their abundance in the agricultural north (Fig. 6.3; also Bar-Yosef 1981b: Fig. 1),

implies that even if cereals were collected, stands were not dense and probably reflect wild plant gathering as opposed to intensive and systematic farming. The key point really is the contrast with the unquestionably agricultural sites of the Mediterranean zone. In this context, it is also notable that the lithic technology used for the production of arrowheads, the production of prismatic blades from bipolar naviform cores (e.g., Khalaily 2009; Quintero and Wilke 1995), is also used for the production of sickle segments. In contrast, the apparent presence of sickle segments in at least some Pre-Pottery Neolithic B sites in eastern Jordan (Garrard et al. 1994b), as rare as they were, suggests more plant exploitation there.

Architecture and Material Culture



Ujrat el Mehed, South Sinai

Figure 6.4 Ujrat el Mehed (Banana I). 1. Site plan, South Sinai (courtesy of the excavators, O. Bar-Yosef, A.N. Goring-Morris, and A. Gopher). 2. Photograph (S. Rosen). Note clustered aspect of architecture; Grid in site plan is in meter squares.

Architecturally, structures can be characterized as curvilinear pit-dwellings (Fig. 6.4; e.g., Bar-Yosef 1984; Beaver 2014; Betts et al. 1998:fig. 3.6; Garrard et al. 1994b; Goring-Morris and Gopher 1983), in marked contrast with the rectilinear structures of the Mediterranean zone. This contrast is important given the presumed origins in the settled zone, suggesting that mobility played an immediate role in the transition to desert subsistence systems. Preserved structures consist of stone slabs placed around the interior wall of shallow rounded pits, usually no deeper than 50 cm, varying in length from 2–3 m to 5–6 m. Shapes vary, including round, oval, or apsidal, figure-8, and

“polygonal”, although at least some of the apparent polygonality derives from the cutting of one structure by another in the course of site development. Right angles are rare. These lined pits undoubtedly served as foundations for organic superstructures, probably of brush. Again in contrast with the north, there is no evidence for the use of mudbrick, no surprise in a desert environment. Features such as hearths, benches, entrances, and possible work tables have been found in these structures. The rounded aspect of this architecture, of course, suggests mobility (e.g., Flannery 1972), again contrasting with the north.

For sites with sufficient horizontal exposure for characterization, structures tend to cluster, abutting one another in an irregular honeycomb pattern (Goring-Morris 1993; Henry and Beaver 2014; Rosen 1988a), with only small open spaces between structures. Although some variability in structure size is evident, it would be difficult to interpret this as reflecting status differentiation or hierarchy. Most site sizes do not exceed 1000 square m. Thus it seems unlikely that site populations exceeded 100 people, if even achieving that figure. A major exception to this appears to be the Middle PPNB site of Jilat 26, covering more than 7500 square m in terms of lithic scatter, with some 20 structures arranged in a linear arc, and including one rectangular building (Garrard et al. 1994a, b). It is likely this site functioned as a seasonal aggregation camp (for example, as reconstructed for the South Sinai PPNB), although without detailed stratigraphic and chronological analysis, it is impossible to know if all structures were indeed contemporary. The function of the rectangular structure is unclear, but it is no larger than other structures. In this context, recent attempts to date cult features in the southern Negev to the PPNB, thus establishing the very early rise of corporate ritual in the desert (Avner et al. 2014), are based on questionable chronological attributions and cannot be accepted. The enclosed pen or courtyard structures which appear in later periods are not present, although there is use of open space outside the structure clusters.

In addition to these larger sites, smaller sites with little or no architecture have also been discovered (e.g., Burian and Friedman 1973, 1975, 1982; Simmons 1981). These seem to represent either smaller group occupations, perhaps a reflection of seasonal dispersion into smaller camps, or special function sites, like quarries.

The material culture of the desert Pre-Pottery Neolithic B is numerically dominated by chipped stone industries (e.g., Betts et al. 2013:9–11; McCartney and Betts 1998, see site descriptions; Gopher 1994:30–42, assemblage descriptions; Baird 1994; Henry et al. 2014; Nowell et al. 2014). In addition to the classic PPNB arrowheads (Fig. 6.5; Helwan, Jericho, Byblos and Amuq points [Gopher 1994:30–42]), these industries are characterized by scrapers on

flakes, retouch blades, burins, awls and borers, and axes, which occur in relatively low numbers in the Central Negev sites, but are virtually absent farther south. Waste assemblages are dominated by flakes, but prismatic blades struck from classic PPNB bipolar naviform cores are common, used primarily for arrowheads. Although assemblages differ in their functional configurations (read type frequencies) from those found in agricultural areas, they are generally typologically and technologically similar to those of the north. Gopher (1994:249–251) has noted that Negev and Sinai arrowheads are less symmetric than those of the north, perhaps indicating lesser degrees of expertise, this in turn perhaps attaching to a lower level of incipient craft specialization (e.g., Barzilai 2010).

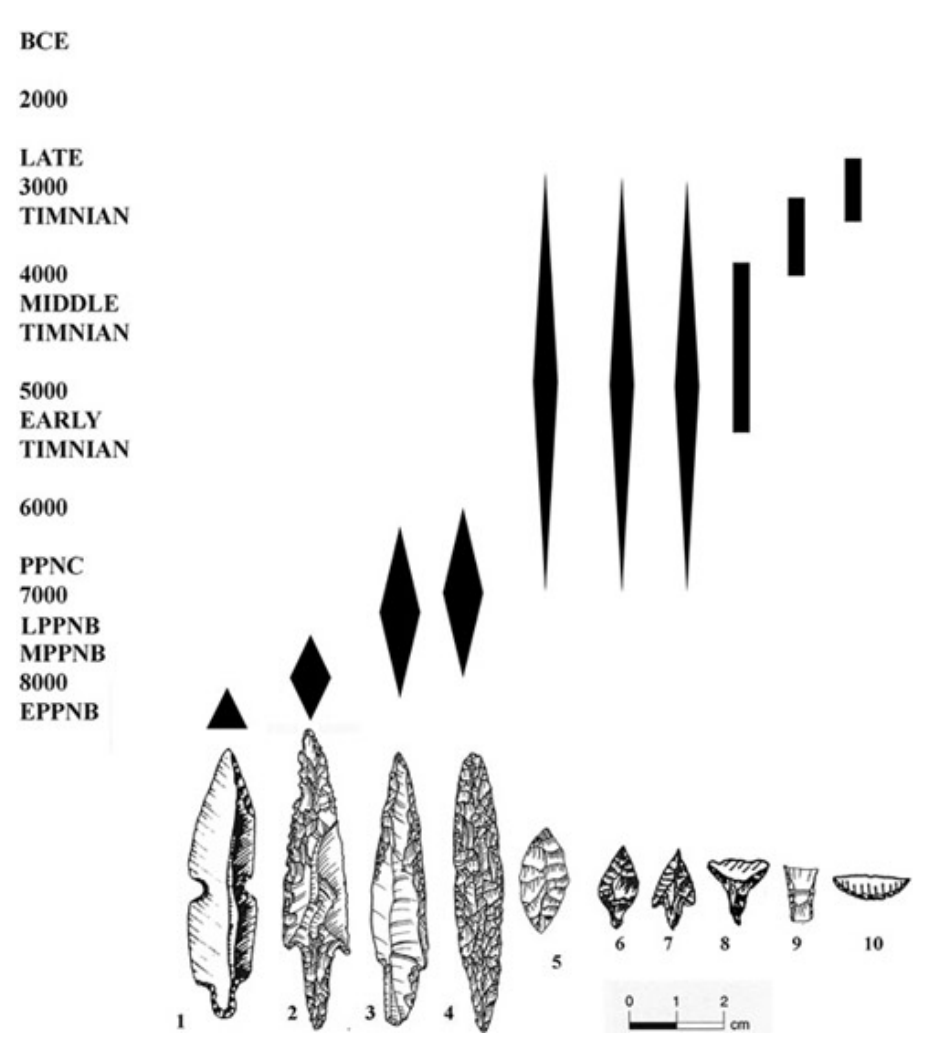


Figure 6.5 Schematic of arrowhead types and chronology in the Negev, from the Neolithic

through the Bronze Age. 1–4, large blade technology; 5–10, small blade/flake technology. 1. Helwan point, 2. Jericho point, 3. Byblos point, 4. Amuq point, 5. Herzliya point, 6. Nizzanim point, 7. Haparsa point, 8. Triangular transverse point, 9. Quadrilateral (rectangular) transverse point, 10. Microlithic lunate (transverse point).

Beyond the flint artifacts, grinding stones of varying raw materials (depending on locale) are common, found at virtually all of the habitation sites. They consist of basal stones of larger dimensions (metates); somewhat-smaller, upper-loaf-shaped rubbers (manos); and mortars and pestles (e.g., Bar-Yosef 1984; Garrard et al. 1994a; Kadowaki 2014).

Bone tools, manufactured using splintering and polishing techniques, complement the stone tools, but are rare, probably due to problems of preservation. The assemblage is comprised primarily of spatulas, awls, and different kinds of points (e.g., Goring-Morris 1993). A few figurines, of stone and bone, have also been recovered from desert PPNB sites (e.g., Burian and Friedman 1973: Fig. 3). Contexts do not seem to reflect any special concentrations or particular ritual function.

Shell beads, used for different kinds of jewelry, constitute the final significant component of desert PPNB material culture. They are found on nearly all sites, sometimes in the hundreds (Bar-Yosef Mayer 1999). In the South Sinai sites the shells derive almost exclusively from the Red Sea, but these Red Sea shells are also found in northern sites (Bar-Yosef Mayer 1997) such as Jericho (Reese 1991), where Mediterranean shells are also found. Bar-Yosef Mayer's (1997) suggestion that they may have been used as a medium of exchange is of interest, especially considering the asymmetry of the shell trade. She further suggests that in exchange for Red Sea shells, South Sinai hunter-gatherers may have received grain (Bar-Yosef Mayer 1999:76–166). However, given the distances involved, the bulk of grain, and the absence of pack animals in this period, it is likely that exchange was primarily in the form of precious goods more easily transported.⁹

Society in the Desert PPNB

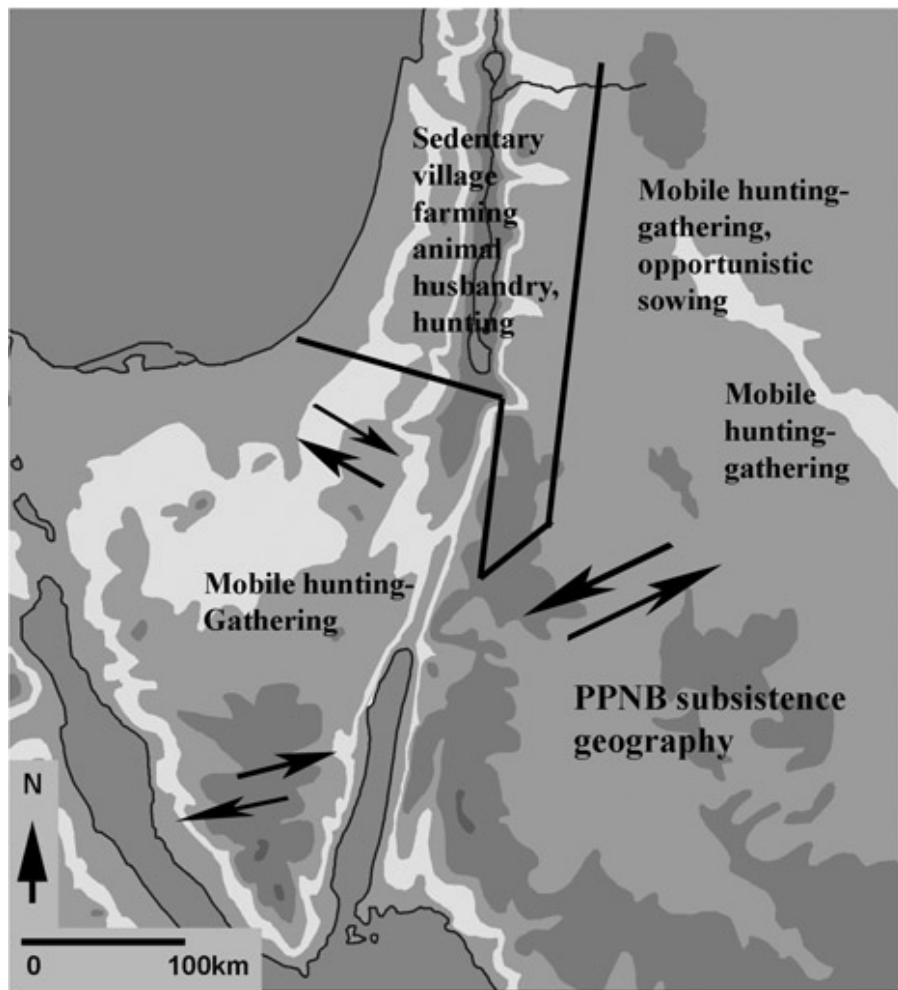


Figure 6.6 Schematic map of PPNB subsistence geography after introduction of domestic goats into settled zone with models of upland-lowland mobility.

Sources: Bar-Yosef 1984; Henry and Beaver 2014; Simmons 1981.

Based partially on these size contrasts, both Simmons (1981) for the Central Negev and Bar-Yosef (1984) for South Sinai suggest that desert Pre-Pottery Neolithic B groups engaged in a seasonal round, based primarily on vertical movement to exploit geographic contrasts (Fig. 6.6). Simmons (1981) proposed a pattern of Highland Negev summer aggregation into larger sites, and winter dispersal into smaller sites, such as those of the lowland western Negev dune areas (cf. Goring-Morris 1987 for the Natufians and Harifians in the preceding Epipaleolithic). Bar-Yosef (1984) proposed a similar model of movement from summer encampments in the highland areas of central South Sinai to winter sites in the lower coastal zones of Sinai. Based most notably on a variety of

flint sources, Henry and Beaver (2014) suggest seasonal movement between Wadi Rum and the Ma'an Plateau, although their reconstruction assumes transhumant herding.

None of these models of residential seasonal movement adequately addresses the mechanisms of north-south (or east-west for Jordan) movement which must also have existed. In addition to the lithics, shells, and greenstone mentioned above, Anatolian obsidian is also known from the Negev Pre-Pottery Neolithic B (e.g., Burian and Friedman 1988). Although the quantities of the materials being transported between north and south do not seem especially great, and were certainly within the capabilities of societies without pack animals, they also seem to reflect a steady stream of connection, occurring over a long period. Clearly there were systemic connections between the core PPNB society and the desert. As mentioned earlier, Bar-Yosef and Belfer-Cohen (1989) suggest that hunting bands, both those from the Mediterranean zone and those from the desert periphery, may have been the prime purveyors of such connections. Of course, the issue of group territoriality must also have played a role in establishing what areas were accessible to what groups; hunter-farmers and hunter-gatherers have territories as a matter of course, and if they are maintained and enforced to different degrees and in different ways, they nevertheless structure group interaction. Thus beyond the linkages expressed in the exchange system, underlying social connections and structures must have also existed, perhaps related to the origins of the desert Neolithic groups in the settled zone, or perhaps established expediently to facilitate exchange. If mobile hunting bands were at the ultimate base of these contacts between regions, they nevertheless must have been structured by social linkages, perhaps justified by tribal-type kinship, or perhaps client-consumer-type structures tying into social hierarchies.

In addition to contrasts in subsistence and mobility (Fig. 6.6), the structure of production in the desert PPNB differs from that of its sedentary cousins. In particular, the organization of blade production (to be distinguished from technology) seems to differ between the settled zone and the desert. Barzilai (2010) has demonstrated the incipient specialization evident in blade production in the village-based PPNB (also see Khalaily 2009). If the types and technologies for blade production in the desert are on the one hand similar, Gopher (1994:250) has noted a lesser expertise in production, evident in lesser degrees of symmetry in the arrowheads, and unlike the north, there is no spatial analytic evidence for restriction of production, except insofar as quarry sites are present (Barzilai and Goring-Morris 2011). This is not to deny the existence of informal experts; Simmons (1981) suggests that the uniformity of arrowheads found at Nahal Divshon may reflect a single producer, and the

larger numbers of arrowheads would imply that he or she was making arrowheads for more than personal consumption. This makes sense if one assumes a (complex) band-level structure of desert PPNB society, where even within bands one may expect varying degrees of skill, with perhaps consequent differential personnel of production. Regardless, in terms of specialization in lithic production, the desert systems do not approach those of the village farming systems farther north.

The general paucity of other realms of material culture in the desert, and the relatively simple technologies needed to produce shell beads and milling stones, renders other comparisons moot. On the other hand, other complex technologies, such as plaster production, brick production, plastered skull molding, and complex architectural construction, all probably requiring specialized knowledge reflecting expert practitioners, are present only in the settled zone.

Another notable contrast is the absence of evidence for public structures and monumental architecture in the deserts, in clear contrast to the public buildings and cult structures of the heartland of the southern Levantine PPNB (e.g., Goring-Morris 2005; Rollefson 1998). On the other hand, mortuary behavior in the desert PPNB shares important features with its northern counterpart in the removal of skulls and intramural burial (Hershkovitz et al. 1994), although it lacks the plastered skull cult (Verhoeven 2002). Foreshadowing later discussion, evidence for such phenomena as monumental cult architecture occurs in the desert only later, after the transition to herding economies. Of course, the absence of such structures suggests that centralized cult and, indeed, social hierarchy are of a lesser order in the desert. This picture accords with the absence of architectural variability which might reflect status differentiation mentioned earlier. This is not to claim that desert cultures did not possess elaborate and sophisticated cosmologies and symbol systems, but that these were not physically manifested in the same fashion as those of their northern contemporaries. The transition in the desert to elaborate public cult in the periods following the PPNB ([Chapter 8](#)) also plays a role in our understanding of the general evolution of desert societies.

Thus there are major contrasts in economic and social structures between the agricultural zone PPNB and the desert; incipient specialization, division of labor beyond age and gender, social distinction, and hierarchy versus relatively autonomous production systems, low-level expertise systems, and social structures based on only minimal status distinctions. These differences reflect at least partially the much larger population aggregates in the heartland of the PPNB, with individual site populations reaching hundreds of individuals if not thousands, and contrasting with the smaller desert groups, essentially complex bands with relative economic autonomy. However, if demography is perhaps a

proximate cause to the differences between the economic and social structures of the Mediterranean zone and the desert, the contrasts between sedentism and mobility, and food production versus foraging, are also integral to these issues. Territoriality, sedentism, and intensified production, as well as population growth and public ideology, are all interlinked (e.g., Rosenberg 1998) in the Neolithic, and if the linkages are not perfectly correlated, all are factors which must be considered when explaining both the divergence between desert and sown, and the evolution of desert food-producing societies.

Summary

The archaeology of the desert Pre-Pottery Neolithic B society seems to reflect a complex band type of organization based on subsistence-level hunting and gathering. Populations are low. While there is evidence for seasonal band aggregation, these probably comprised only a few households. Larger aggregation sites in the desert, either in the form of very large occupation sites or massive special function sites (e.g., cult sites),¹⁰ have not been found. Trade with the north, while regular and part of the general system of contacts, was not intensive, although it appears to be systematic. There is little evidence for interdependent relationships. If on the one hand, these contrasts between the farming communities of the Mediterranean zone and the desert zone hunter-gatherers are of the essence for understanding the divergence evident between the societies with the evolution of herding societies, the cultural and social continuities and connections are no less crucial given origins of the domestic animals themselves in the settled zone.

Notes

- ¹ It is crucial in reading these early accounts of the rise of agricultural society to understand that the radiocarbon chronologies pre-date dendrochronological calibration, so all the dates look very late.
- ² Zeder (2008) has most recently indicated that there is little time difference between the domestication of cereals and that of herd animals. Biologically this is correct, but it begs the point that experimentation with cereals has minimally a 10,000 year history (to judge from Ohalo II [Weiss et al. 2004]) preceding the ultimate genetic transformations that mark the end point of domestication. This is not the case with respect to goats, whose domestication occurred in the context of sedentary villages, either engaged in intensive

- gathering of domesticates-to-be, or in farming proper, depending on the definitions.
- 3 Ullah (2013) has recently completed a series of simulation studies of subsistence strategies based on the Neolithic site of Wadi Ziqlab, in Jordan (also Ullah 2011). He has convincingly concluded (among other things) that single-variable models for explanations of collapse are inadequate.
 - 4 For example, Horwitz (2014) computes MNI of 5 sheep/goats at Late Timnian sites of Ein Hameara I and 4 MNI at Ein Hameara II, both in the Negev Highlands. Horwitz (2003a) computed an MNI of only 40 gazelle and goats together from a total of 1,131 bones from the MPPNB at Yiftahel (together constituting 58% of the bone assemblage; the gazelle comprise 31 of the 40 MNI), that is, a ratio of almost 30 bones to one individual. Kohler-Rollefson et al. (1993) indicates a total sheep/goat bone count of some 3,500 bones for 200 m² from the Ain Ghazal Middle PPNB horizon. Conservatively assuming a ratio of 20:1 bones-in-the-assemblage:animals-slaughtered (a very conservative estimate), this results in about 175 animals. This may sound like a large number, but the MPPNB occupation at Ain Ghazal lasted well over half a millennium. Even for the small area of 200 m², these are low numbers of animals slaughtered.
 - 5 The evidence for cereal agriculture at Ain Abu Nukhayla is based on morphometric statistical analysis of single-celled phytoliths comparing known species of domestic cereals with the archaeological samples. Given the lack of overlap between the samples, the fact that wild cereals were not included in the comparative sample, the failure to actually present the confidence limits of the statistical tests, the extremely low proportion of glossy (sickle) blades (~0.5%, much lower than agricultural sites in the north), and the absence of any macrobotanical evidence for cereals (in spite of the preservation of macrobotanical remains [McCorriston and Ekstrom 2014]), the evidence for agriculture at the site is equivocal at best.
 - 6 The problem of the definition of *desert* comes into play here. Sites like Beidha, which contains a transitional Pre-Pottery Neolithic A/Early PPNB component (Kirkbride 1966), although located in an arid or semi-arid region today, in fact enjoyed a much-ameliorated environment during the earlier times. Basically, the areas around Petra and Wadi Hasa cannot be considered part of the desert periphery in this period. Phyto-geographic maps of Jordan show a much greater southward extension of both the Mediterranean and Irano-Turanian zones than in the equivalent latitudes of the Negev (Fig. 5.4). This was probably even more the case during the climatically ameliorated PPNB.
 - 7 The Mushabian culture complex also seems to expand into the Sinai and Negev at this time, deriving perhaps from the Nile Valley (Bar-Yosef 2013).
 - 8 Phytoliths from woody plants cannot be identified to lower phylogenetic levels.
 - 9 A similar problem occurs in North America, where exchange systems focused primarily on “preciousities” (e.g., Bittman and Sullivan 1978). Exchange of bulk goods, like maize, was limited by the fact that without pack animals, one would need to eat what one was transporting in order to survive a long trip.
 - 10 Rothenberg (1980:125, fig. 28) published what he claimed to be a PPNB open air shrine based on associated lithics. More recent research has established that similar shrines are exclusively dated to the 6th millennium BCE (Avner 2002:99–126; Porat et al. 2006).

The Earliest Herder-Gatherers

The Adoption of Domesticated Animals in the Desert Periphery

Introduction

The earliest evidence for systematic herding of domestic animals in the desert zones of the southern Levant is found in the period succeeding the collapse of Pre-Pottery Neolithic B society, in the 7th millennium BCE. In the north this period is known as the Pre-Pottery Neolithic C (e.g., Rollefson and Köhler-Rollefson 1993) or Terminal Pre-Pottery Neolithic; Khalaily (2009) has suggested the culture name of *Ghazalian*, after the type site for the period, Ain Ghazal (e.g., Rollefson 1998). In the Negev, Goring-Morris (1993, Goring-Morris et al. 1994) has dubbed the equivalent culture *Tuwailan*. No separate *culture* name has been proffered for Eastern Jordan. This early stage is followed in the 6th millennium BCE by the consolidation or crystallization of a subsistence-level herding society in which herding to a great extent replaced hunting; gathering continued to play a primary role. These earliest stages in the long evolution of desert pastoral systems can be characterized as herding-gathering (Rosen 2008; cf. Gilbert 1983); they represent essentially a subsistence economy in which herding has replaced hunting, but in which the ultimate potentials for intensification of production are little seen—that occurs somewhat later. The asymmetric economic relations between sedentary societies of the Mediterranean zone and desert pastoral societies, one of the defining characteristics of pastoral nomadism in its ethnological sense (cf. Khazanov 1984; Salzman 1971, 1972; [Chapter 3](#) in this volume), evolved only later, beginning perhaps in the late 5th millennium BCE, and crystallizing only in the 4th and 3rd millennia BCE.

Thus, the chronological gap between the appearance of domestic goats in the PPNB in the farming zones of the Near East and the evidence for herding in the desert is substantial, somewhere on the order of 1,000 years, depending on

the locale. This gap is even more impressive in light of the apparent rapid diffusion of the domestic goat throughout the Near East. Taking the archaeological evidence at face value, the earliest evidence for goat domestication (and thus the putative origins) is to be found at the site of Tepe Ganj Dareh, in northwest Iran (Fig. 6.1 for location; Hesse 1982; Zeder and Hesse 2000), in the second half of the 9th millennium BCE. In the Levant, this is at the earliest stage of the Middle PPNB (Kuijt and Goring-Morris 2002). Depending on still-imprecise chronologies, the appearance of goats in the sedentary zone of the Southern Levant (Fig. 6.6 for contrast between farming and hunting-gathering zones in Southern Levant) may be contemporary, but appears to be perhaps a few hundred years later. Assuming for the sake of argument that goats were indeed domesticated in the north or northeast (as indeed the evidence suggests), where wild goat herds can still be found, the diffusion throughout the PPNB village farming matrix was rapid indeed, occurring within a single archaeological sub-period, the Middle PPNB (MPPNB), throughout the Near Eastern village farming matrix.

This rapid diffusion is a crucial point. As reviewed in the preceding chapter, goats were adopted into sedentary village PPNB society, replacing hunted animals, yet with little material evidence reflecting this process. In recent doctoral research, Effenberger (2012) has shown that PPNB villages in the southern Levant show only hints of architectural or site furniture changes intended to accommodate the presence of domestic animals. There is virtually no decline in arrowhead proportions in the lithic assemblages (Fig. 6.1), a possible material culture indicator for a shift from hunting to herding, in the transition from Early PPNB (EPPNB) to MPPNB, nor is any decline evident from Middle to Late PPNB. Furthermore, there has been no documentation of PPNB herder camps, stabling horizons in rock shelters, corrals or loci with obvious dung accumulations, or any other special function sites or loci which might be associated with herding. The adoption of goats into the PPNB village matrix, well-evident in the faunal assemblages, seems to have caused barely a ripple in the material record. This is not to say that goats were not important, but rather that they seem to have been accommodated relatively easily into the existing PPNB lifeways. As per the discussion in Chapter 6, this in turn suggests that the scale of the early adoption of goats was probably limited, and this would not require the full set of social tools, technologies, and knowledge that would be needed to manage large herds.

Based on the presence of wild goats in low numbers, and indicators of possible stages of domestication in the Southern Levantine faunal assemblages, Martin and Edwards (2013) suggest that goats were domesticated more or less contemporaneously across the Near East, excluding the desert regions, thus explaining the rough contemporaneity of the appearance of domesticates.

However, this suggestion does not address the apparent rapidity of the reversal of faunal configurations in the Levant, and in some contrast to the Tepe Ganj Dareh sequence where goat hunting preceded goat herding. If a claim for pan-regional domestication is made, *per contra* the argument of rapid diffusion, then the same argument *vis à vis* the transition from hunting to herding would apply—it occurred rapidly and across the entire PPNB farming zone matrix, albeit with some variability (e.g., Horwitz 2003a). Diffusion seems a more likely explanation.

Regardless, given the rapidity of the expansion of animal husbandry across the village farming societies of the PPNB, the chronological gap between the adoption of goats in the settled zone and the desert indicates that the desert, or perhaps better, the desert societies, comprised a barrier to that process. Indeed, one may conclude that the adoption of domesticate herds into the hunting-gathering societies of the Near Eastern deserts was a deeply different process from that of the initial diffusion or incorporation of domesticates within the farming zone. It required a fundamental realignment of society (cf. Ingold 1980), a realignment which included new technologies, new social organization, and new ideologies and values. This process required considerably greater time than did the adoption of goats into village society. Of course, in this context it is important to remember that the advantages of the wholesale transition to a domestication economy, which seem so obvious to us in hindsight, would not be obvious at all to PPNB desert hunter-gatherers.

The Chrono-Cultural Framework

In the Negev, Goring-Morris (1993) divided the general period following the PPNB collapse into four sub-periods: a Pre-Pottery Neolithic C phase, ca. 6700–6250 BCE (cf. Kuijt and Goring-Morris 2002), which he terms the “Tuwaiian” (Goring-Morris et al. 1994); an Early Pottery Neolithic phase, ca. 6250–5700 BCE; the Nizzanim Pottery Neolithic phase, ca. 5700–5100 BCE; and the Qatifian phase, ca. 5100–4700 BCE. The latter two periods are tied to the Coastal Plain, to which he links the (western) Negev sequence. Although Goring-Morris does not extend his sequence into the Chalcolithic period, Kozloff’s (1973, 1981; also Rothenberg and Glass 1992) surveys, test excavations, and radiocarbon dates suggest that in the Sinai and Southern Negev the cultural continuum indicated by Goring-Morris extends well into the Chalcolithic, and indeed into the Early Bronze Age I. Kozloff (1973, 1981) and Rothenberg and Glass (1992) referred to this long developmental sequence

by the culture term “Timnian”, and this was adopted and redefined by Rosen (2011c), as well as others (e.g., Gilead 2011, also for Jordan see e.g., Abu-Azizeh 2013; Henry and Turnbull 1985 for early adoption of the term) (Tables 1.1, 7.1). The absolute chronologies are based on radiocarbon, but the number of dates from well-documented occurrences is actually rather limited, and much of the chronology for areas south of the settled zone derives from synchronisms with other areas. Given the demonstrably different tenor of culture change in the desert region, for example the continued use of triangular transverse arrowheads in the desert at least a millennium after their disappearance from the sedentary north and the independent southern evolution of other transverse types (Rosen 2011c), such synchronisms can be accepted only cautiously.

Table 7.1 The Timnian Culture sequence compared to other sequences.

<i>Absolute</i>	<i>Culture Names</i>	<i>North</i>
<i>Chronology BCE</i>		
<i>Rosen (2011c)</i>	<i>Goring-Morris (1993)</i>	<i>Rothenberg and Glass (1992), Kozloff(1981, 1973) and Ronen (1970)</i>
		<i>Gopher and Gophna (1993), Gilead (2011) and Regev et al. (2012)</i>
2000		
<i>terminal</i>		IB/EBIV
		III
		EARLY
3000	<i>late</i>	BRONZE II
		EARLY
		BRONZE
		AGE
TIMNIAN		/
		<i>late</i>
4000		
		TIMNIAN
		GHASSULIAN
<i>middle</i>		
		BESORIAN
5000		QATIFIAN
<i>early</i>		WADI RABA
	NIZZANIM	
		EILATIAN
EARLY	EARLY	LODIAN

6000	POTTERY	POTTERY	YARMUKIAN	
NEOLITHIC	NEOLITHIC			
TUWAILAN	TUWAILAN		PPNC	
7000	PPNB	PPNB	PPNB	PPNB

Together these early transitional periods span more than two millennia, significantly longer than, for example, the Pre-Pottery Neolithic B. Unfortunately, even given this long period, sites and excavations are few and each phase or subphase may be represented by only one or two excavated examples. Furthermore, the geographic distribution of the sites in the different phases is limited, partially as a result of low numbers, and partially due to our inability to adequately correlate different culture phases in different areas. Thus, the Tuwailan is defined on the basis of lithic industries recognized primarily from bifacial knife quarry sites (Goring-Morris et al. 1994), and in terms of site distribution has so far been confined to the western Negev and east Central Sinai. The Timnian was defined for South Sinai and the southern Negev (Kozloff 1973; Ronen 1970; Rothenberg and Glass 1992), and only later extended to the central Negev (Rosen 2011c) and to Southern Jordan (e.g., Henry 1995:353–374; Henry and Turnbull 1985). Finally, the Qatifian, as defined by Gilead (1990; also Abadi-Reiss 2009) is restricted to the northern Negev and northeastern Sinai, and is very clearly a settled agricultural society. More recent syntheses (Rosen 2011c, 2013; Saidel and Haiman 2014) and for Jordan, e.g., Abu-Azizeh 2013, 2014, Abu-Azizeh et al. 2014; Betts et al. 2013; Rollefson et al. 2014) have offered better data for the actual content of the cultural sequence. It is this content which allows for a reconstruction of the rise of pastoral societies in the desert.

The Earliest Evidence

The earliest *direct* evidence for herding in the central Negev consists of a dung layer attributable to goats (or, less likely, sheep) discovered in the lowest levels of the Ramon I Rock Shelter (Rosen et al. 2005) and well dated by radiocarbon analysis to the end of the 7th millennium BCE (Table 7.2). Ramon I is located on the north cliff of the *Makhtesh* Ramon (Crater), about 1 km west of Ma’aleh Ramon, a major ascent out of the crater (Fig. 7.1 for general location). It is easily accessible by foot paths from the ascent, both from the bottom and the top of the cliff. Stratum III,₁ about 1 m beneath the modern surface and between 5 and 10 cm thick (Fig. 7.2), contained preserved dung pellets, attributable by shape to *Capra* or *Ovis* (Fig. 7.3), charcoal, compressed dung,

and evidence for general burning of the rock shelter surface sediments.² Preservation is clearly attributable to the protection afforded by the rock shelter and the general aridity of the region. The five radiocarbon dates (from four samples) were obtained from burnt dung, sediments derived from that dung, and plant material. No artifacts were found in association with this lowest layer.

The use of rock shelters for stabling small stock is well known throughout the Near East. In the Negev, recent Bedouin still use such overhangs and deeper caves to shelter animals from the elements, especially during the cold winters of the Central Negev Highlands (Meraiot 2011:187–194). Although ibex are known to enter such rock shelters, the deposition of a substantial layer of dung must indicate human manipulation. The only other ungulate inhabiting the region, gazelle, leaves a very differently shaped dung pellet. Di Lernia (2001) has noted a similar prehistoric phenomenon in the herding of wild sheep into a rock shelter in North Africa. In the case of the Ramon I Rock Shelter, there can be no question but that the animals comprised a domestic herd given the absence of wild progenitors³ in the region. Between the compression and burning of the dung layer, one may estimate a volume reduction of between 50% and 90%, indicating fairly intensive exploitation of the rock shelter. Burning of dung layers is a common practice among recent pastoralists and is conducted in order to kill off parasites and perhaps to reduce the volume of earlier fill. The burnt deposits are thus also a marker for intensity of exploitation. It is notable that above Stratum III the Ramon I rock shelter shows repeated (if episodic) use for stabling especially in the 3rd millennium BCE, and in recent times, as do many others (Rosen et al. 2005; Rosen 2013). Other rock shelters show similar, if not necessarily synchronous periods of stabling.

Table 7.2 Radiocarbon and calibrated dates from the Ramon I Rock Shelter. No. 4 is from west section. Nos. 12 and 9 were taken from same stratigraphic lens (field designation C), clearly the contact between strata III and II. The numbers in the table do not correspond to the numbers in Fig. 7.2.

<i>Lab #</i>	<i>Site</i>	<i>Stratum</i>	<i>Uncalibrated</i>	<i>S.D.</i>	<i>Calibrated</i>	<i>Source</i>	<i>Delta 13C</i>
			<i>Date bp</i>		<i>interval 1 S.D.</i>	<i>material</i>	<i>PDB</i>
1 RTT5726	Ramon I	IA	post-bomb		post-1950 CE	dung	-23.1
2 RTT5727	Ramon I	IA	150	55	1660-1950 CE	dung	-22.3
3 IEMAE1396	Ramon I	IB	1396	91	544-764 CE	dung	-
4 RTK6338-2	Ramon I	IIA	3910	55	2470-2310 BCE	seed	-21.7
5 RTT5732	Ramon I	II	4340	60	3030-2890 BCE	textile	-24.3
6 hRTk6337	Ramon I	II	4380	55	3090-2915 BCE	sediment	-22
7 RTK6337-1	Ramon I	II	4490	55	3340-3100 BCE	dung pellets	-19.4
8 RT 5729	Ramon I	II	4390	35	3090-2920 BCE	twigs	-21.3
9 RTT5728	Ramon I	II	4360	70	3090-2900 BCE	dung	-15.3
10 RTT5730	Ramon I	II	4370	70	3090-2900 BCE	dung pellets	-20.8
11 IEMAE1319	Ramon I	III	6050	118	5204-4796 BCE	sediment/ dung	-
12 RTK6339-1	Ramon I	III	7270	60	6215-6075 BCE	dung pellet humic after ABA	(-23.5)
13 RTK6339-2	Ramon I	III	7230	60	6210-6030 BCE	dung pellet humic after WBA	-23.5
14 IEMAE1358	Ramon I	III	7213	84	6203-5934 BCE	plant material	-
15 RTT5731	Ramon I	III	7030	80	6000-5830 BCE	burnt dung	-17.1

The five radiocarbon dates from Layer III (from four samples) bracket a period roughly 6200/6000 BCE to 5000 BCE, the late 7th and 6th millennia BCE (Table 7.2). Given that four dates cluster around 6200/6000 BCE, and only the upper date is later (and derived from the pilot sample at the base of the section to

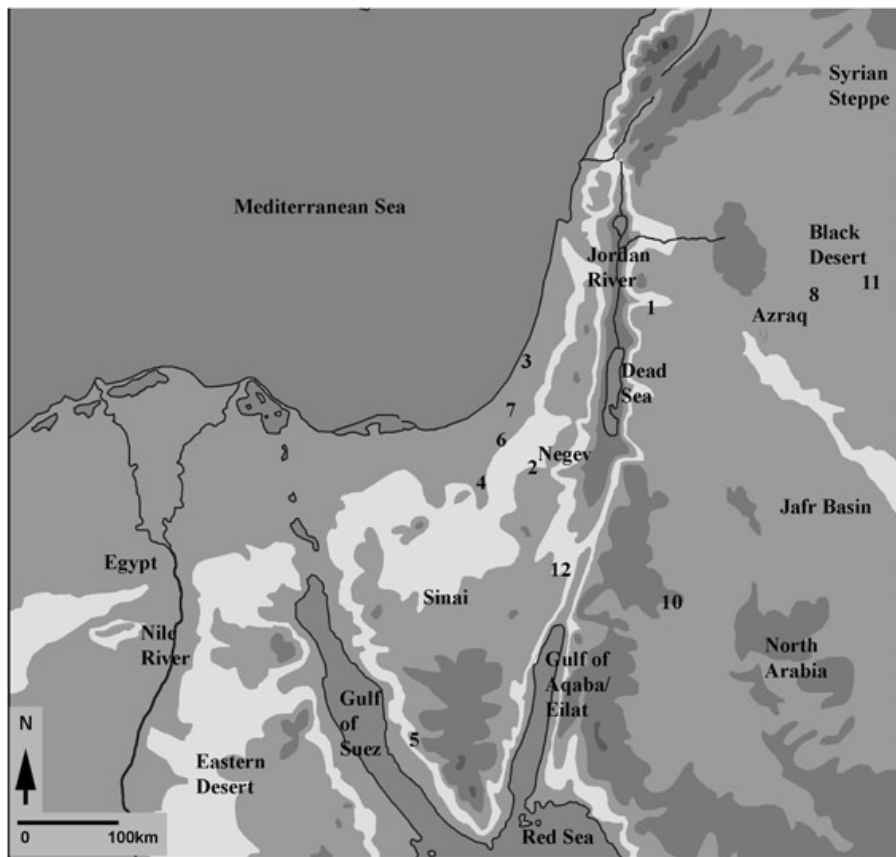


Figure 7.1 General map of Southern Levant during the transition to Herding-Gathering. 1. Ayn Ghazal, 2. Ramon I Rock Shelter/Ma'aleh Ramon, 3. Ziqim, 4. Qadesh Barnea sites, 5. Wadi Jibba sites, 6. Har Qeren, 7. Be'er Osnat, 8. Dhuwaila, 9. Jilat sites, 10. Ayn Abu Nukhayla, 11. Burqu' Sites, 12. Nahal Issaron.

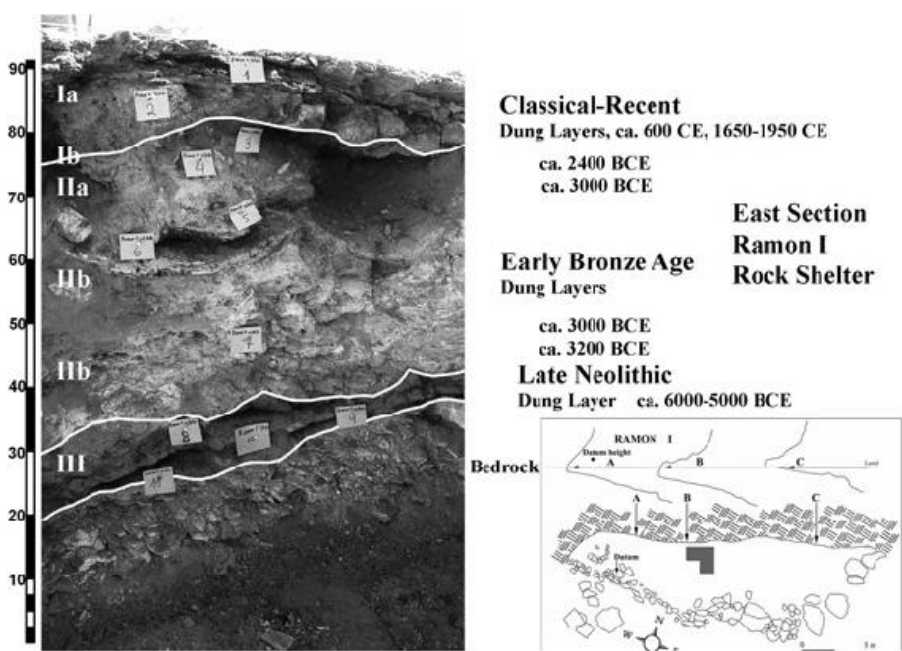


Figure 7.2 The stratigraphy and chronology of the Ramon I Rock Shelter. See [Table 7.2](#) for list of radiocarbon dates. Strata numbers as in Rosen (2013). Stratum I, divided into Ia and Ib, shows a single Classical period date (see [Table 7.2](#)) at base of Stratum/top of Stratum IIa, indicated a short episode of stabling.

establish the antiquity of the site, thus without detailed provenience),⁴ it is possible that most of the occupation was in the earlier part of the span; however, given the nature of the deposition and exploitation, including the burning and compression of the dung layers (distinct lenses are evident), it is impossible to determine this. Although only two delta ^{13}C values were calculated for two overlapping dates/samples from this level, -17.1 and -23.5 PDB, the variation between them suggests grazing both above the *Makhtesh Ramon*, in the steppe zone with a mix of C3 and C4 vegetation, and within the *Makhtesh*, the desert zone, with more C4 vegetation.

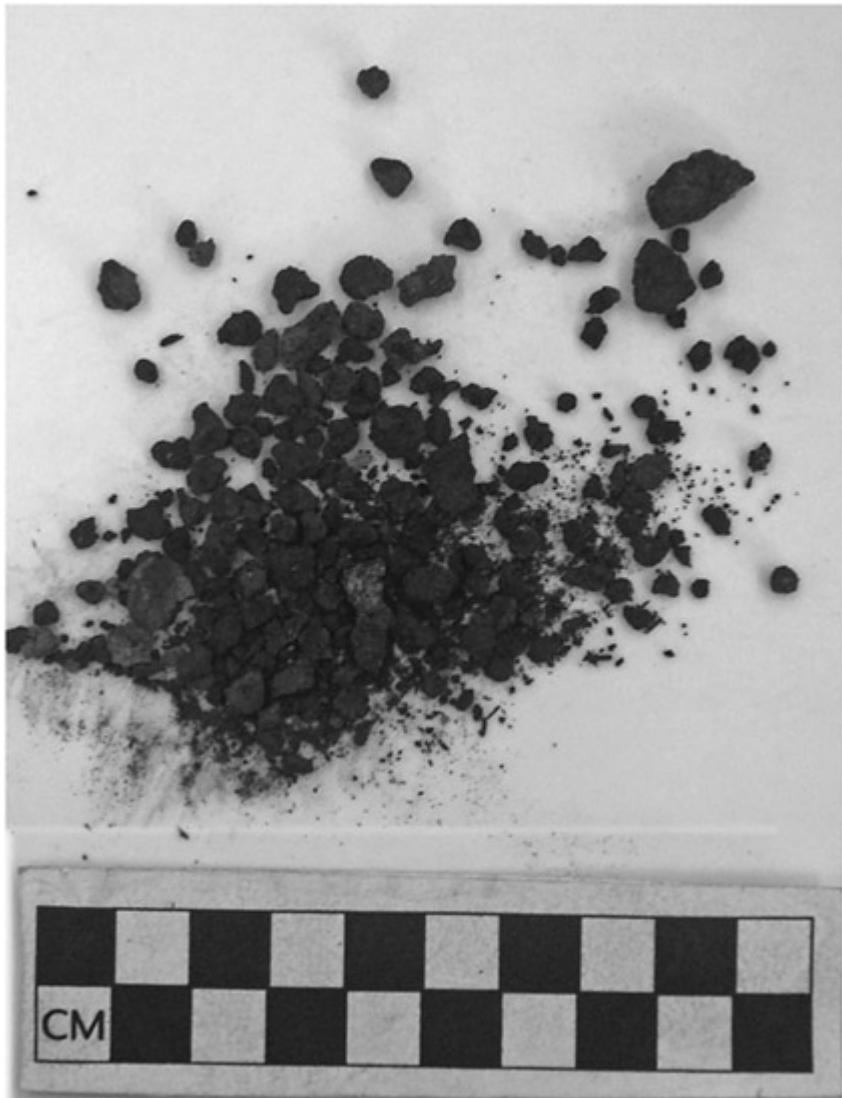


Figure 7.3 Dung pellets from Ramon I Neolithic (Stratum III).

Although the dung layer in the Ramon I Rock Shelter marks the earliest direct evidence for herding in the Negev Highlands, it is unlikely that this horizon marks the earliest penetration of goats (or sheep) into the region. Rather, it offers a marker for the use of rock shelters for stabling animals, a specific adaptation which need not have been amongst the earliest tools developed for desert pastoralism. In fact, given the paucity of excavations from the 7th and 6th millennia BCE (and the even greater paucity of publications), the Ramon I Rock Shelter offers a chronological fix, a *terminus ante quem*, by which time we know that systematic pastoralism was established. Thus, sites with known dates, but from which bones and other direct evidence for animal

husbandry were not recovered, can be linked to pastoral adaptations, and the general cultures of this earliest period of pastoralism in the Negev can be characterized.

Somewhat earlier than the Ramon Rock Shelter, the PPNC, or Tuwailan, has been little explored in the Negev and Sinai. In his summary paper, Goring-Morris (1993) lists only three occupation sites: Hamifgash III and V, and Qadesh Barnea 31 (Gopher 1994:151), and two special quarry sites for bifacial knife production: Har Qeren V and XIV (Goring-Morris et al. 1994; Goring-Morris and Rosen 1987:13–15, 61–69). These sites were surveyed, but beyond the lithic assemblages they can be little characterized. Architecture is present at the three occupation sites, but in the absence of excavation it cannot be described except as to indicate that structures were probably round and oval, and served as bases for organic superstructures. The lithic assemblages are a continuation of PPNB traditions, most obviously in the presence of large blade arrowheads, the Byblos and Amuq types (Fig. 6.5). The later, smaller Nizzanim types (tying into the post-PPNB; cf. Gopher 1994:41; Khalaily 2009; Rollefson and Köhler-Rollefson 1993) also appear (Fig. 6.5). Goring-Morris (1993) notes a reduction in the proportion of arrowheads in the lithic assemblages in the desert, suggesting that this reflects a decline in the importance of hunting; on the other hand, at Ayn Ghazal Rollefson and Kohler-Rollefson (1993) note that arrowhead proportions remain stable in the transition from PPNB to PPNC and into the Yarmukian (the early Pottery Neolithic), in spite of the clear decline in hunted species in the faunal assemblages. The small number of sites, the usually small sample sizes (especially in terms of the proportion of sites excavated in the larger northern sites), and the variability evident within the general PPNB arrowhead percentages suggest such trends may as yet be difficult to reliably define. The most chronologically diagnostic artifacts are the bifacial knives (foliate knives, tile knives, etc., Fig. 7.4), and these provide the link between the sites, as well as with the early Pottery Neolithic sites the southern Coastal Plain, most notably Ziqim (e.g., Garfinkel et al. 2002).

Somewhat later, in the second half of the 7th millennium BCE, sites like Qadesh Barnea 3 (in east central Sinai) and Wadi Jibba II and IIa, in western Sinai, all excavated (Bar-Yosef 1984; Gopher 2010, 1994:112, 139), have round dug-out structures with stone wall bases, either single rooms or only a couple of attached rooms. Lithic assemblages are similar to those of the preceding phase, although they are dated by radiocarbon somewhat later. None of the sites preserved bone assemblages,

Unfortunately, beyond the ostensible decline in arrowhead frequencies (Fig. 6.1), there is little to demonstrate the replacement of hunting by herding. Although Goring-Morris (1993) suggests that the bifacial knives were in fact used for slaughtering or skinning domestic herds, this is a difficult argument.

Hunted animals would also need to be skinned and simple flakes could be used just for this as well. It is unlikely that the elaborate bifacial knives, the products of some kind

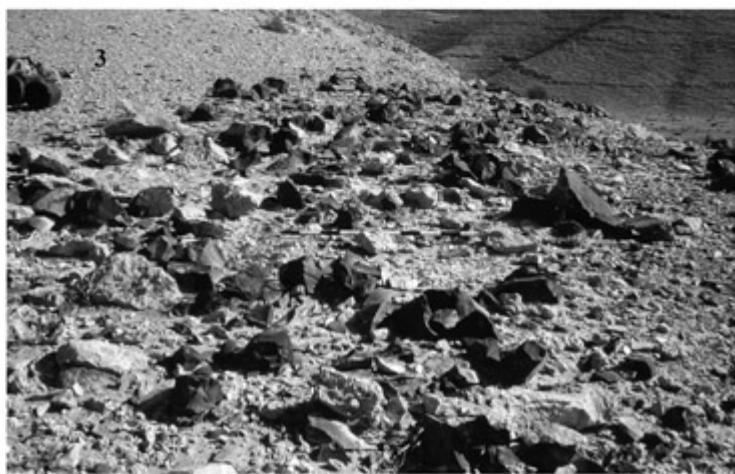
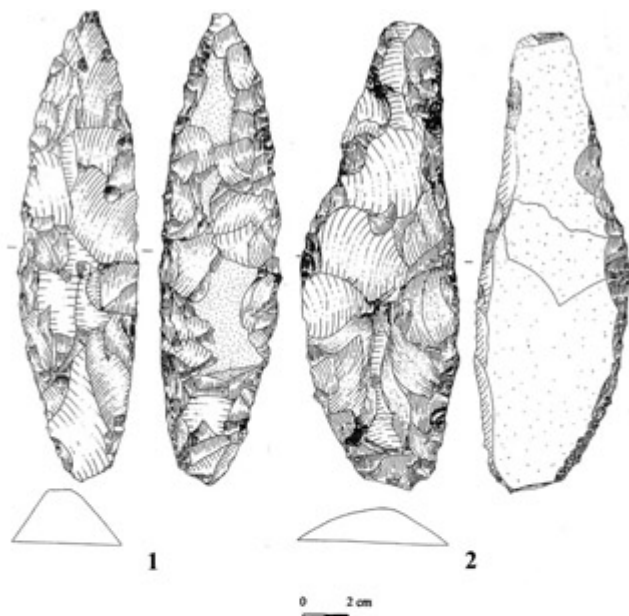


Figure 7.4 Har Qeren V. 1–2. Bifacial knives (Goring-Morris and Rosen 1986:fig. 2.5E-A-6), 3. View of the site and core scatter. Note scale in center of photo.

Source: Photo by S. Rosen.

of expert production system and traded into more northern areas (to judge by the exclusive presence of quarries in the south), are indicators of domestic herds, although they seem to be attached to cultures which herded animals. The discovery of a cache of three knives near Be'er Osnat (Crowfoot Payne

1978), in the northwest Negev, about 20 km north of the Har Qeren quarries, indeed at least indirectly supports the idea of trade objects.

Goring-Morris (1993) also suggests that the links with the Coastal Plain offer a source for ostensible domesticates, as well as seemingly a kind of guilt by association—both areas show bifacial knives, so the domesticates were probably shared as well. However, Garfinkel and Dag (2008:281–288) have claimed that the Coastal Plain sites were cattle camps (in this, ignoring the clear evidence for agriculture at these sites), and cattle never penetrated the Negev in any numbers. There is also a difference in the directionality of contacts. If indeed the bifacial knives moved north in an exchange system of some kind, this is not evidence for a different kind of system bringing domesticates south.

Both Goring-Morris and Garfinkel and Dag (also Shirai 2009; Smith 1989) see the southern Coastal Plain sites as the source area for Egyptian domestic animals, ultimately arriving in Egypt at the beginning of the 6th millennium BCE. This is a likely scenario, but moving along the coast need not directly entail penetration southwards (even given the relatively short distances), especially if the coastal sites were agricultural.

In the end, bifacial knives and ostensible connections with the Coastal Plain are not sufficient indicators that the desert sites had goats or sheep. We cannot rule this out, but in the meantime, the question must remain open.

In significant contrast to the Negev, surveys and excavations in the Badia, the desert of eastern Jordan, provide clear evidence for the adoption of caprovines into PPNC or early Late Neolithic society (Betts et al. 1998; Betts 2008; Betts et al. 2013; Byrd 1992; Garrard 1998; Martin 1999; Martin and Edwards 2013; Rollefson et al. 2014). Based on her work on the faunal assemblages from a number of sites, Martin (1999; Martin and Edwards 2013) noted that in the earliest stages of the adoption of herd animals into the desert and steppe, they did not comprise the absolutely dominant species in the economies of the steppe peoples. Rather, she suggested a generalizing hunter-herder-gatherer adaptation (also Betts 2008). The variability is especially evident in the site of Dhuwaila, with 96.7% gazelle and 0.5% sheep and goats in the faunal assemblage, indicating undoubtedly a specialized hunting camp, as compared to the roughly contemporary site of Jilat 25, with 71.2% caprines and only 6.2% gazelle (Garrard et al. 1994b). Sheep outnumber goats in all the sites where the distinction can be drawn with any reliability, and up to 75% of them were slaughtered before the age of 3.5 years old, indicating a likelihood that they were exploited for their meat and not milk (Garrard 1998), and certainly not wool, for which there is no evidence until much later (Levy and Gilead 2012).

The presence of cereal remains and other grasses at Jilat 13 (Garrard et al.

1996, 1994a, b) accords with the discovery of sickle segments in the lithic assemblage, suggesting some form of farming, presumably fairly opportunistic and matching recent ethnographic behaviors (Garrard 1998). The presence of ground stone objects, vessels, hand stones, and querns at some of these sites accords with the recovery of cereals and other grasses, presumably used for seed preparation. It is worth noting here that, as indicated earlier, the Azraq basin and perhaps to a lesser extent the Jafr Basin were considerably moister during the mid-Holocene; the ameliorated environment of the region is what undoubtedly enabled the opportunistic exploitation of a range of resources. In this the region contrasts with the central Negev, which if somewhat moister during the PPNB, nevertheless seems not to have experienced such increased water resources in this period (cf. Enzel et al. 2008).

Spanning the 7th millennium BCE in eastern Jordan, architecture seems to continue more or less in the PPNB tradition. Structures are round and oval pit dwellings of various shapes with walls of different kinds of stones (depending to a great extent on the specific region) which presumably served as foundations for brush superstructures. Garrard et al. (1994a) note that these are somewhat larger than the preceding PPNB structures, increasing from ca. 10–20 m² in area to as large as 30–60 m², and suggest that this may reflect changing social structure to accommodate somewhat larger groups. On the other hand, overall site size does not seem to increase in this period, and PPNB Jilat 26, with 20 structures total and about 0.785 hectares in area, seems to be the largest constructed site in the entire sequence. Hints of special architecture, perhaps ritual related, in the form of pillars, possible statuary, and pavements are found at Jilat 13 (Garrard et al. 1994a,b), but even if these are cult related, they are domestic in scale. The enclosure and attached room architecture which characterize later periods (e.g., Abu-Azizeh 2013; Rosen 1988a) are not evident in this early phase.⁵

As in the settled zone, lithic industries in the early Late Neolithic in eastern Jordan also show both important points of continuity with the preceding desert PPNB as well as evolving contrasts. The classic Byblos and Amuq PPNB arrowheads continue through the transition, and as in the sedentary zone, assemblages show increasing proportions of Amuq points. As in the Mediterranean zone, the small points, Nizzanim and Herzliya points, and to a lesser extent Haparsa points, are added to the repertoire, and Badia points seem to be a local variant of these. Transverse points are added toward the end of the sequence (Betts et al. 2013:93 for Badia points, for other points, figs. 2.8:7; 3.8:2–4; 3.14:2, 6, 9; 3.25:1–13; 3.36:1–6; 3.44:1–14; 3.52:11; 4.6:2–3). Truncation burins are also a common feature in both the PPNB and Late Neolithic assemblages, and sites with large proportions of burins have been referred to as “burin sites” (e.g., Betts 1982). In some contrast to the PPNB, as

in the Negev and Sinai, bifacial knives and large foliate points, and unifacial variants called tile knives, are diagnostic pieces for these early Late Neolithic sites. Again, as in the Negev, these are sometimes found in caches, as at Jilat 13 (Garrard et al. 1994b), perhaps indicating that at least some of them were exchange goods.

This issue of trade goods is also of importance in reconstructing the nature of this very earliest herding-gathering society. As per the PPNB, both the Negev/Sinai sites and those in eastern Jordan show sea shells and shell beads, although the Jordanian late Neolithic materials all seem to derive from either freshwater sources or the Red Sea, as opposed to the Mediterranean (e.g., Garrard et al. 1994a). Shells from the Sinai and Negev sites are also predominantly from the Red Sea (e.g., Bar-Yosef Mayer 1997, 2005). Stone beads (Bar-Yosef Mayer and Porat 2008), for example, the Dabba marble beads in the Jordanian sites (e.g., Cooke 2013), are essentially local, although like the bifacial knives, they would appear to represent an expert system of production and probably reciprocal exchange, probably continuing the PPNB bead production and exchange system (Wright and Garrard 2003).

The First Desert Pastoralists: A Review Discussion

The earliest evidence in the southern Levantine deserts for the adoption of goats and sheep into the subsistence systems of these desert societies can be dated to the early-mid 7th millennium BCE, especially in Jordan. By the end of this millennium, herds seem to have displaced hunting as the primary source of meat in these societies. Three facts are to be noted:

1. There is a significant chronological gap, on the order of a millennium, between the introduction of domestic goats and sheep into the adjacent settled farming zone during the PPNB, in the early 8th millennium BCE, and the subsequent adoption of the animals into hunter-gatherer societies of the desert.
2. The transition to desert herding occurred over a long time span, and consisted of a set of processes, not merely the incorporation of animals into hunting-gathering bands. It was not an event, but a process, and of course hence the long span of time over which it occurred. The material and social ramifications of the adoption of domestic herd animals are not *obviously* evident in these societies until the end of the 7th or early

6th millennium BCE, another gap of about a millennium.

3. The chronological coincidence of the PPNB collapse and the introduction of domesticates cannot be mere accident and will be reviewed below.

The integrated social matrix referred to as the Levantine PPNB Interaction Sphere (Fig. 6.1; Bar-Yosef and Belfer-Cohen 1989) in all its variability (Asouti 2006) achieved its peak in social, economic, demographic, and apparently political complexity in the Southern Levant in the Late PPNB with the rise of aggregated villages in Jordan, megasites, achieving sizes of 10 hectares or more. These settlements had populations which probably exceeded 1,000 people, depending on the constants used in the demographic calculations. Additional smaller villages were also present, especially on the western side of the Jordan Valley. Farming was a well-established and evolving practice (e.g., Nesbitt 2004). Incipient craft specialization is evident in the organization of some of the lithic production (Barzilai 2009), and seemingly in the complexity of some of the technologies utilized, for example pyro-technologies for making plaster and primitive ceramics. Elaborate mortuary ritual, feasting, and cult practices are also evident (e.g., Cauvin 2000a, b; Simmons 2007:150–159).

In contrast, in the desert periphery, small bands of hunter-gatherers engaged in seasonal movement in order to exploit subsistence resources—water, wild animals, and plants—available in different areas at different times of a yearly cycle (e.g., Bar-Yosef 1984; Simmons 1981). These bands may have aggregated seasonally to form somewhat larger groups, but the twenty structures at Jilat 26 constitute the largest such site, and we may estimate a seasonal aggregate population there on the order of 100–200 people at maximum, and only if all the structures were inhabited contemporaneously. With the single possible exception of Ayn Abu Nukhayla (Dean 2014; Henry and Beaver 2014; Portillo and Albert 2014, but see earlier discussion), none of these sites shows any evidence for the presence of caprovines in any numbers which would suggest systematic herding, although hunting of ibex is evident in some of these sites, and small-scale hunting of goats and/or sheep is possible as well. Given exchange connections with the sedentary system, trade in or theft of sheep or goats cannot be ruled out either.

This hunter-gatherer system connected up with the sedentary farming society in a number of ways. Small-scale material goods—obsidian, green stone, sea shells, and beads—moved back and forth between the hunter-gatherer periphery and the sedentary core zone. Perishables, both in terms of equipment and materials not available in the desert, undoubtedly also moved into the desert. Possible examples may include wood and wooden objects and

textiles *sensu lato*. Given the presence of domestic grains in some of the eastern Jordan sites, perhaps some types of food stuffs were also exchanged. Ideas, as in the diffusion of arrowhead styles, also clearly moved from core to periphery. Although most of these linkages reflect exchange systems which served to maintain social ties and identities (cf. Wiessner 1983, 1984 for Kalahari hunter-gatherer reciprocal exchange of arrowheads; e.g., Wright and Garrard 2003 for PPNB bead exchange), unlike Kalahari hunter-gatherer exchange systems between peer groups, one may expect that exchange between the core and the periphery, even in the Neolithic, was not quite symmetric; if the exchanges did not encompass the dependence relationships later common to desert-sown exchange systems, they did fulfill real needs which if disrupted would have required adjustment.

Bar-Yosef and Belfer-Cohen (1989) have suggested that hunting bands were the primary medium through which information was exchanged within the Levantine Interaction Sphere, notably even during the period when domesticates had been adopted into the system; this can be expanded to include explicitly the hunting bands from the desert periphery, where domesticates had not been adopted. However, given the incipient levels of expertise and possible divisions of labor evident in the sedentary zone, pure reciprocity may not have been the only mode of exchange, and some kind of intermediary agency, perhaps based on kin relations, must also have operated, perhaps attached to the seasonal round of mobility. It is this sub-system which would have been most impacted in the eventuality of general system disruption.

The point is that the collapse of the PPNB system and the abandonment or major contraction of literally all the sedentary sites, in the first half of the 7th millennium BCE, must have had significant impact on the desert periphery. Before sketching out a possible scenario, it is important to summarize again what the desert periphery looked like in the succeeding period, after the PPNB collapse.

In eastern Jordan, there is unequivocal evidence that sheep and goats were added to the repertoire of exploited animals amongst the desert-dwelling bands in the PPNC, again *after* the PPNB collapse. It is clear that these were domesticated, given the almost total absence of these animals in the preceding periods. The variability in hunter-herder faunal percentages also indicates that herding was by no means the exclusive source of meat, and age-sex culling percentages would seem to indicate carnivorous pastoralism, before the advent of milking. This conforms also to the earliest evidence for dairy exploitation in the settled zone, somewhat later in the Late Neolithic (Evershed et al. 2008; but see Helmer et al. 2007 for a contradicting conclusion). This apparent absence of systematic exploitation of secondary products is significant since it reduces the

potentials for intensification of production in the periphery, according well with the essentially subsistence economy of these early desert pastoralist-hunters. The absence of contemporary bone assemblages in the Negev renders direct comparison difficult, but the presence of systematic exploitation of proper herds by 6200 BCE, as evident in the Ramon I Rock Shelter, indicates that the actual adoption of the animals, perhaps not in the form of large herds, must have been earlier.

Over the long term (Fig. 6.1), chipped stone arrowheads clearly decline, and this must be considered reflective of the shift from the hunt to the herd, but the generally high variability in proportions of arrowheads in lithic tool assemblages in this early period makes tracing the details of the trends from the late 8th through the 7th millennium BCE problematic. Notably, the ultimate disappearance of chipped stone arrowheads, not at all related to the introduction of metal points (Rosen 1997:151–164), occurred some two millennia earlier in the settled zone than in the desert periphery; this undoubtedly reflects the continued importance of hunting in the periphery, regardless of the adoption of pastoralism as a primary mode of subsistence. However, the introduction of small points (not yet transverse points) throughout the entire Levant occurs with the collapse of the PPNB, and may be partially related to declining degrees of specialization in production, especially reflected in the abandonment of the sophisticated naviform blade production.⁶ As the transition to domestic animals occurs in the sedentary zone about a millennium before the introduction of the small points, one cannot make a functional case that these represent some basic shift in species exploitation, even if the two transitions seem to coincide in the desert.

Plant exploitation in the periphery, as reflected most clearly in the Jordanian evidence, is based on gathering, with perhaps opportunistic sowing of cereals, a function of the specifics of the geography of eastern Jordan in the presence of basins with seasonal wetlands. In addition to the botanical remains, ground stone tools of different types are found in virtually all habitation sites and were undoubtedly primarily used in vegetal food preparation, beginning with intensive gathering (e.g., Wright 1993, 1994). This gathering mode of exploitation, as opposed to systematic agriculture, is also in accord with the low proportions of sickles in the eastern Jordanian lithic assemblages (relative to village PPNC or PPNB sites), and their virtual absence in Negev and Sinai sites. This continues the pattern evident in the PPNB.

Architecturally, the honeycomb or clustered patterns of PPNB desert architecture continue sporadically into the succeeding period. Few sites have been exposed in sufficient areal extent to offer a complete picture, but for example, Burqu' sites 11000 and 2700 (Betts et al. 2013: Figs. 3.28, 3.29, and 3.18) show indications of additional walls protruding from the excavated loci,

perhaps indicating clustered loci. On the other hand, Qadesh Barnea 3 (Gopher 2010) shows a single round structure with no additional attached walls; the overall plan of Jilat 13 also shows isolated round structures (Garrard et al. 1994b: Fig. 5). The Late Neolithic Wadi Jibba II and Ila sites from western Sinai (Bar-Yosef 1984) also seem to show non-contiguous construction and differ architecturally from the neighboring Jibba I PPNB site in this. As earlier, Garrard et al. (1994a) indicate that in Jordan individual structure sizes may be larger in the PPNC than in the preceding PPNB, but this is not the case for the Negev and Sinai (compare Ujrat el Mehed to Qadesh Barnea 3 [Bar-Yosef 1984, Gopher 2010]).

Although surveys in the Negev and Sinai have suggested that the period following the PPNB expansion was one of demographic decline (e.g., Rosen 1987; also see Avner et al. 1994 for claims of continuity), in a sense paralleling the PPNA site scarcity, given that the PPNB extended chronologically over the course of more than 1,500 years, significantly longer than the succeeding transitional period, if site frequencies are compared over the time spans involved, a demographic decline from PPNB to PPNC/Tuwailan decline in the Negev is less evident. This is even more the case when considering that without the discovery of diagnostic small points or bifacial knives, not always evident in surface survey, it may indeed be difficult to distinguish between Late PPNB and PPNC. In Jordan, there is no clear reduction in site numbers from PPNB to PPNC. Thus, the PPNB collapse so evident in the core zone does not seem to have cascaded into the eastern desert periphery.

In a progressive series of studies, Köhler-Rollefson, Rollefson, and their colleagues (Köhler-Rollefson 1992; Quintero et al. 2004; Rollefson and Köhler-Rollefson 1989, 1993) have proposed a direct connection between increasing stress in the PPNB sedentary system and the rise of peripheral nomadism, referred to specifically as pastoral nomadism. In the earliest iteration of these studies, pastoral nomadic societies developed as an offshoot of shepherds penetrating ever deeper into the steppe, ultimately becoming independent as a result of a degraded environment caused by overgrazing in the proximity of the village sites. This narrative essentially places the source of desert pastoral societies and populations (to distinguish from the source of the animals themselves) in the fission of sedentary society (cf. Bar-Yosef and Khazanov 1992). In addition, general environmental degradation, the consequence of overgrazing and deforestation caused by the need for fuel for plaster production, was seen as the prime cause for the collapse of the PPNB system. In a later iteration, climatic change is seen as a stressor for the PPNB (e.g., Rollefson et al. 2014; Weninger et al. 2009), but the 8.2ky climatic deterioration (e.g., A. Rosen 2007:97–99) occurred half a millennium after the final stages of the PPNB (and depending on where one dates the end of the period, it could be

more), and in fact coincides with the end of the PPNC.⁷

This scenario for PPNB collapse has been critiqued for a number of reasons (e.g., Bar-Yosef 2002; Rosen 2011b), and most scholars see the decline of PPNB society as a social rather than ecological or environmental phenomenon (e.g., Goring-Morris and Belfer-Cohen 2010; Kuijt and Goring-Morris 2002). For our purposes here, the important point is that PPNB sedentary society *did* disintegrate, the large aggregate populations did disperse, and this process coincided with the adoption of sheep and goats in the desert and steppe periphery. This coincidence should not be seen as coincidence.

Seeing in the PPNB collapse a direct cause for the rise of pastoral nomadism, Rollefson et al. (2014) suggest that the displaced populations of the PPNB penetrated into the desert with their herds; the local desert hunter-gatherers are seen as marginal to the process. There are a number of reasons for rejecting this scenario.

Implicitly, this reconstruction assumes that in the collapse of the integrated PPNB societies, farming was no longer possible in the core zone and hence pastoralism was an almost necessary alternative. Yet there is no evidence for significant climatic or environmental degradation ca. 6700 BCE, the period of the putative deterioration and collapse. In the absence of such degradation, the abandonment of sedentary farming for mobile pastoralism, by people who had been well ensconced in a sedentary farming system (to distinguish from the known flexibility of modern mobile pastoralists), is not an obvious alternative. That is, even given the disintegration of the megasite component of the PPNB, a more obvious response than displacement to the arid periphery would seem to be a smaller-scale farming society. This is what happened, for example, in the collapse of Early Bronze Age urban society in the Levant—it reverted to village-based society (e.g., Bar et al. 2013; Edelstein et al. 1998; Richard 1980, 1986).

Beyond this rather theoretical issue, given the large population of the sedentary system prior to collapse, if the desert absorbed substantial numbers of displaced farmers, one might expect an increase in site numbers (especially in light of the seasonal nature of occupation), but as indicated above, no such increase is evident. In the event, the Negev and Sinai were also part of this overall picture, yet the Cisjordanian PPNB never showed the large population aggregates of its Transjordanian counterparts, so that a source population for these southern areas is not clear.

The faunal assemblages of the desert PPNC are also problematic for the fission framework because they reflect a slow adoption of herd animals, a mix of hunting and herding. By the late PPNB in the sedentary zone, herding dominated animal exploitation; at Ain Ghazal in the LPPN, caprovines comprised 71% of the bone assemblage, up from 51% in the preceding MPPNB

(Kohler-Rollefson et al.1993). This contrasts with the picture obtained from the PPNC desert periphery, where, for example, at Jilat 13 sheep and goats together comprise only 20% of the assemblage, at Jilat 25 where they comprise 59%, and at Azraq 31 (the PPNC loci), about 40% (Martin 1999). These numbers are too variable and too low to be convincing evidence for the movement of herders *and their herds* out of the Mediterranean zone into the steppe.

Finally, material culture remains from the 7th millennium BCE in the desert reflect a general continuity with those of the preceding desert PPNB, and contrast with the core zone PPNB, from which they would ostensibly have been derived. This is most especially evident in the architecture, in the continued use of oval and round brush structures, with stones used in foundations alone, greatly differing from the rectilinear brick, stone, and plaster structures of the settled village sites. The contrasts are also evident in all that the desert PPNC is lacking relative to a putative ancestor in the sedentary PPNB, with its elaborate mortuary behaviors (e.g., plastered skulls) and structures, sophisticated pyro-technologies (in heat treatment of lithics, plaster, ceramics), and other aspects of symbolic behaviors (e.g., ceramic figurines and statuary, vaisselles blanches, etc.).

If one then rejects the general import of herding societies into the desert, the only alternative is the adoption of domesticated sheep and goats by the desert hunter-gatherers, and the adapting of those animals to a desert pastoral lifestyle. The mechanisms of the adoption demand discussion, if nevertheless it is difficult to be definitive.

Since we can assume that the desert folk of the PPNC did not adopt and domesticate wild herds, the introduction of sheep and goats into the desert system could have occurred in one or more of three basic ways: 1. Animals could be acquired through exchange from the source area, the settled zone; 2. Animals could be acquired through theft from source area herds; and 3. Animals could be brought in by migrants from the source area. It is likely that all three of these mechanisms operated at one level or another.

1. Exchange: The exchange of animals between herders and farmers, herders and consumers, middlemen, etc. is ubiquitous ethnographically. In later periods with complex economic systems, such exchanges probably took place in the context of markets and market systems. For the Neolithic, in the absence of markets, exchange probably took some form of reciprocity, perhaps based on kin relations, and perhaps attached to other forms of exchange (as outlined earlier). Of course, in modern contexts, the animals are traded from the periphery into the consumer market, and not out to the desert, in this case the herder-hunter-gatherer system. It may be that in the earliest stages, animals

were traded out from the sedentary settlements as meat on the hoof, rather than necessarily for herding. Such a scenario might indeed explain some of the isolated instances of caprine bones in PPNB Neolithic faunal assemblages.

2. Theft: Navajo acquisition of sheep from the Spanish in the 17th century CE began gradually, most likely with theft and raids ((Brugge 1983; Kelly 1986; Weisiger 2004). Prior to this period, Navajo subsistence was based on hunting-gathering with some cultivation; after it, herding supplemented the subsistence until the mid 19th century when political upheavals resulted in a shift to specialized sheep pastoralism, most notably based on wool exploitation. Similarly, raiding has been a common means of augmenting herds among many pastoral groups ethnographically, for example Nuer cattle raids against the Dinka (Evans-Pritchard 1940:125) or among camel nomads in the Near East (Sweet 1965). Given that the initial herds of sheep and goats in the desert were apparently part of a more generalized subsistence system of hunting-gathering, or herding-hunting-gathering, absconding with animals originating in the settled zone may well have been one means of acquiring them.
3. Migrants: That domesticated sheep and goats were introduced into desert foraging societies, and that the process was one of adoption and not fission of the sedentary societies and colonization of the periphery, does not preclude the possibility that migrants out of sedentary society brought seed stocks, and perhaps requisite knowledge, into the desert. Remembering that both hunting and partial mobility remained components of PPN society, in this context one may note that ethnographically the movement of individuals back and forth between settled and nomad is certainly common (e.g., Barth 1961:113–122; Marx 1992), often attaching to specific life histories (specifically episodes of poverty or wealth). Given the pre-existing social ties that must have existed between the farming and hunting-gathering-herding-to-be communities, movement back and forth is more than likely.

If it is virtually impossible to parse out these alternatives of how the animals got to the desert, the connections between core and periphery must have established the parameters of that process. There were clearly well-established systems of exchange and contact between the desert and sedentary systems (and, given the possibility of theft, one should not rule out less-friendly contacts), of both material goods and ideas. This cannot be stressed enough; contact and exchange are not random, but rather followed classic structures of small-scale societies, based on personal connections, sometimes formalized in

social structures such as kinship, fictive or not, or other social structures establishing the roles of the specific actors. Given the clear existence of such structures which set the frameworks for exchange of shells, beads, obsidian, and ideas such as arrowhead paradigms, it is most parsimonious to attach to these structures the introduction of the domesticated animals into the desert.

Having set the stage, the collapse of the PPNB system seems to have triggered the adoption of domesticates into the periphery. The precise scenario may be difficult to reconstruct, but given the abandonment of the mega-sites on the eastern side of the Rift Valley and the deterioration of the village system on the west side, the system of exchange and contact between the settled village farmers and the mobile hunter-gatherers in the periphery must have surely must have been impacted, most clearly at the level of the disappearance of the physical nodes of interaction, the sites themselves. In the collapse of incipient specialist production systems in the PPNC (Khalaily 2009), and the continued market for desert goods which most especially served purposes of identity and affiliation (perhaps even more important in times of social stress), then ready compensation for those goods would be animals on the hoof.

The question as to why sheep and goats did not penetrate earlier (one of those “why not?” questions) should probably be answered on two levels. As indicated earlier, animal husbandry in a sedentary farming context is different from mobile pastoralism, and the development of the requisite skills and tools probably required some time. We can also posit that the value of sheep and goats in the early stages of animal husbandry was relatively high, and that selling animals off to peripheral hunter-gatherers was not economically attractive. However, with the disruption of system balances at the end of the PPNB, such value systems must also have been affected. In the smaller-scale village and hamlet system of the PPNC, selling off surplus animals was a good solution for converting the risk of raising animals into durable goods, even if such goods might be primarily ideological in substance, that is, beads, shells, and other goods traded in from the desert. Such fluctuations in the value of exchange goods in times of social disruption are not surprising. For example, Sharp (1952) documented the major disruptions initiated to Australian exchange systems with European contact. Thus, the adoption of sheep and goats into the desert periphery following the PPNB collapse can be seen as a social response to changing economic conditions.

Notes

- 2 Richard Macphail conducted the sediment analyses and identified these processes.
- 3 The identification of wild sheep in Epipaleolithic contexts at Har Harif (Davis et al. 1982) does not constitute sufficient evidence to suggest large indigenous populations which might densely occupy the rock shelters.
- 4 I am grateful to Arkady Savinetsky, of the Severtsky Institute for Evolution and Ecology of the Russian Academy of Sciences, for helping with the proveniences.
- 5 The site of a-Ghirqa, in the Azraq Basin, which Betts et al. (2013:fig. 2.30) includes in their survey of Late Neolithic sites, shows this kind of architecture, but there is no chronology available. Significantly, of the only three arrowheads reported in the lithic assemblage, all were transverse points, suggesting a later date both in the absence of large blade points, the presence of the transverse points, and in the very low number of arrowheads recovered in general.
- 6 The production of long PPNB arrowheads from naviform bipolar cores required a high degree of expertise (Barzilai 2009; Quintero and Wilke 1995), in this case clearly evolved in the context of sedentary village society. As pretty and delicate as the small pressure flaked points of the Late Neolithic appear, their manufacture requires less expertise than the large PPNB points.
- 7 Rollefson et al. (2014) cite Migowski et al. (2006: fig. 4), Bar-Matthews and Ayalon (2004: fig. 9-c), and Mayewskia et al. (2004: fig. 1-o); the confusion in dates seems to have been engendered by mixing BP with BCE, all calibrated. The climatic change is well dated to ca. 8200 BP, 6200 BCE, well after the PPNB collapse, at the latest, ca. 6700 BCE (Kuijt and Goring-Morris 2002).

Revolution in the Desert

The Timnian Culture Complex and the Implications of Systematic Herding

Introduction

Beginning nearly a century ago, the rise of agricultural economies and village society in the Near East has long been characterized as a revolution (e.g., Childe 1951:59–86). If perhaps not revolutionary in the sense of extreme rapid change as per a political revolution (and, of course, rapidity of change is relative), then certainly the evolution of agricultural societies in the settled zones of the Near East *is* revolutionary in the sense that it has changed every aspect of human culture and society. The introduction of domestic herd animals into the hunter-gatherer societies of the arid peripheries of the region entailed similarly far-reaching consequences. In the period following the initial adoption of sheep and goats into the desert, the archaeological record reflects profound changes in these societies, changes not only in basic subsistence economy, but in technologies, social organization, and crucially, ideology and cosmology. In this sense, the revolution in the desert parallels that of the sown, if somewhat later.

On the other hand, the parallel is deceiving. On the face of it, the introduction of domesticates into the desert in the 7th millennium BCE clearly precedes the archaeological manifestations of the social effects of that introduction; the changes in architecture, technology, cult, and social organization are only evident by the early-mid 6th millennium BCE. If at some basic level the revolutions in the desert and the sown are indeed congruent, then the chronology of the desert system(s), with the economic change evidently preceding the social, would seem to indicate that claims for the primacy of cognitive change in the rise of Neolithic society (e.g., Cauvin 2000a,b; Hodder 2006; Mithen 2007) are over-emphasized; it would thus appear that the revolution in the desert suggests that first the economy changed and

only afterwards the rest of the social matrix.

In fact, the revolutions are not congruent and the parallels are only partial. The shift from hunting-gathering to agriculture and animal husbandry in the settled zone, if we begin it from the earliest evidence for systematic gathering of cereals (at Ohalo II, for example [Weiss et al. 2004]), took on the order of 10,000 years. Even if one traces the origins of the process only back to the Natufian, then the rise of village farming with biologically domesticated plants and animals took anywhere from three to five millennia. This tremendous difference in the length of the respective revolutions reflects fundamental differences in process. Before pursuing that discussion, it is necessary to present the basic features and chronologies of desert societies following the initial introduction of domestic animals in the 7th millennium BCE.

The Timnian Culture Complex

The period following the adoption of domestic sheep and goats into the southern Levantine desert societies (Fig. 8.1 for site and area locations for Early-Middle Timnian), in the 6th and 5th millennia BCE, saw two parallel processes emerge in the general region. In the arid periphery, the Timnian Culture Complex emerged, its cultural traits evolving concomitant with the crystallization of mobile pastoralism as the defining feature of desert society. In the settled zone, Late Neolithic and Chalcolithic societies developed into the precursors of an early Mediterranean village matrix, complete with the range of Mediterranean agriculture, secondary products, and ever more complex technologies culminating (in retrospect), of course, with the rise of early metallurgy. If always linked at one level or another, these two cultural trajectories evolved in parallel, each adapting to a different set of ecological circumstances and socio-political factors. The two trajectories converge toward the second half of the 5th millennium BCE, with the emergence of the Chalcolithic Ghassulian culture (including the Beersheva Variant) and increased links to the deserts, most notably (if not exclusively) in the rising demand for copper (e.g., Golden 2010). The rise of complex societies in the north in the succeeding Early Bronze Age, and the increased connections and developing economic asymmetries in those connections, separate the early and middle phases of the Timnian from the late and terminal phases, and it is those two early phases, contemporary with the Pottery Neolithic and the Chalcolithic periods in the north, that will be discussed in this chapter.

If the desert cultures show social and cultural continuities with the

preceding PPNB in the early transition to herding (in the 7th millennium BCE), a distinct cultural trajectory can be traced more or less beginning at the end of the 7th and beginning of the 6th millennium. The Ramon I dung layer, Layer III (Fig. 7.2), can be taken as a kind of marker for the emergence of specialized herding, with shepherds stabling flocks well beyond the confines of occupation sites themselves, perhaps 10–20 km distant,¹ and it is really only after this datum that the attributes which define the Timnian began to emerge.

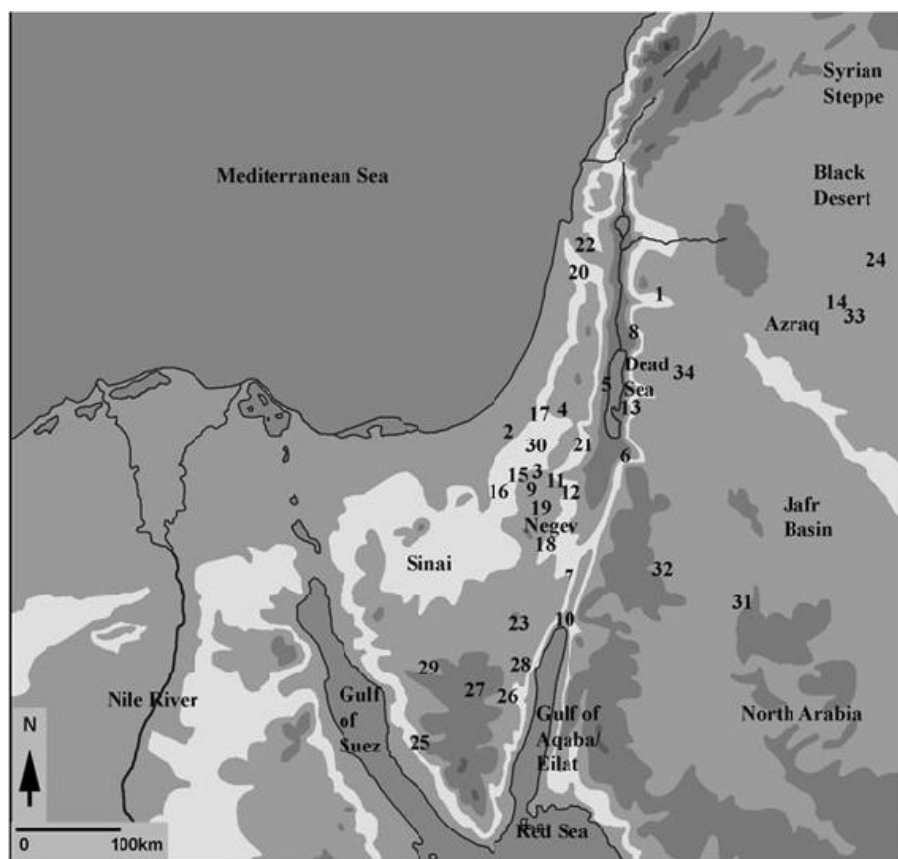


Figure 8.1 Map of site and area locations for Early-Middle Timnian and sites mentioned in this chapter. 1. Ain Ghazal, 2. Ezuz, 3. Har Michia, 4. Beersheva, 5. Nahal Mishmar, 6. Feinan, 7. Timna, 8. Ghassul, 9. Ramon I rock shelter, 10. Eilat/Aqaba, 11. Camel site, 12. Ramat Saharonim, 13. Bab edh Dhra, 14. Dhuwaila, 15. Kvish Harif, 16. Har Harif, 17. Shiqmim, 18. Uvda Valley sites (Nahal Issaron), 19. Be'er Ada, 20. Megiddo, 21. Nahal Tsafit, 22. Kfar Horesh, 23. Hashem al-Tarif, 24. Burqu' sites, 25. Wadi Jibba sites, 26. Ein Hudera, 27. Jebel Gunna, 28. Wadi Feiran (per Ronen 1970), 29. Serabit el Khadim, 30. Zalzal Cave, 31. Wadi Thuwaythuwa/Jabal Kabd, 32. Jebel el-Jill, 33. Maitland's Mesa, 34. Wadi Qusayr.

Definitions

The Timnian culture or complex was first defined by Kozloff (1973, 1981) based on research conducted in the course of surveys and test excavations in Sinai and the Negev by Rothenberg and his colleagues (Merkel and Rothenberg 1999; Rothenberg 1972:51–53; Rothenberg and Glass 1992; Rothenberg and Weyer 1980), and named after the Timna Valley, in the southern Negev. Kozloff's (1973) initial formulation, essentially culture-historical, was based on the lithic assemblages, and in it he compared the Timnian to other lithic industries of the general region, including that of the PPNB, the Eilatian and two additional industries proposed by Ronen (1970), the East Coast Industry and the Wadi Feiran industry. In these formulations, the Eilatian was seen as immediately following the PPNB and was noted to be reminiscent of Paleolithic industries, including the alleged reintroduction of the Levallois technique. The Timnian followed the Eilatian, which in turn was followed by the East Coast and Wadi Feiran industries, assigned to the 4th and 3rd millennia BCE, apparently both overlapping and succeeding the Timnian. Although in his later study, Kozloff (1981; also Rothenberg and Glass 1992) explicitly defined the Timnian as a desert pastoral society, the earliest definitions were based on lithic assemblages.

Recognizing the essential similarities of the Negev/Sinai and southern Jordanian materials, Henry (Henry 1992, 1995:354; Henry and Turnbull 1985) adopted the term in his analyses of sites in southeastern Jordan, explicitly linking the culture to a mobile pastoral desert society. Synthesizing much of this material, I attempted a comprehensive culture-chronology (Rosen 2011c; also Gilead 2011 for general contexts), defining the Timnian based on a set of archaeological attributes extending well beyond lithic typology and technology, and offering a chronological sequence of phases within the complex from the 6th through the 3rd millennia BCE ([Table 7.1](#)).

Beyond the regions for which the Timnian was initially defined, Abu-Azizeh (2013) has acknowledged similarities between sites in southeastern Jordan/North Arabia and those of the Timnian, explicitly attributing them to the Timnian complex. Similarly, sites surveyed in eastern Jordan (Betts et al. 1998; Betts et al. 2013) are also similar although not explicitly attributed to the Timnian, and more recently Rollefson and his colleagues (e.g., Rollefson et al. 2014; Rowan et al. 2015) have investigated a series of habitation and mortuary sites which also seem to fall into the same general complex. It needs to be stressed here that if, on the one hand, archaeological systematics strive to achieve some equivalence with ethnography, spans of thousands years are hardly commensurate with any kind of ethnographic equivalence (also see

Abu-Azizeh 2013). The Timnian is a culture complex which links evolving ecological and economic adaptations and social and cultural attributes to offer an archaeological narrative.

Domestic Architecture and Settlement

As reviewed earlier, architecture in the desert PPNB can be categorized as honeycomb or clustered huts with stone foundations and brush superstructures, and that of the PPNC/Tuwailan as either similar or of freestanding huts (Fig. 6.4). In contrast, Timnian architecture can be characterized as comprised of compounds, central enclosures with rooms or huts attached around the periphery (e.g., Fig. 8.2;

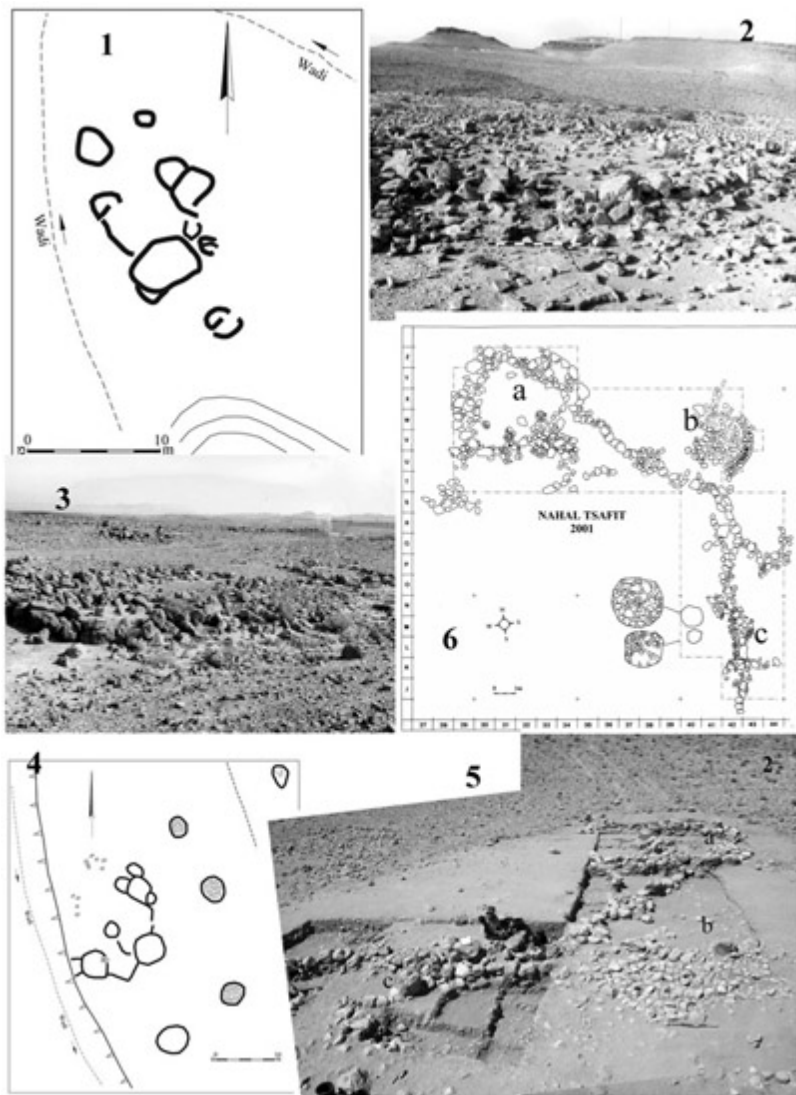


Figure 8.2 Enclosure and attached room sites. 1. Plan of Site 197 (Late Timnian, Early Bronze Age), Map 201 of the Archaeological Survey of Israel, 2. Photograph of Site 197 (S. Rosen), 3. Photograph of Site 233 (Late Timnian, Early Bronze Age), Map 201 of the Archaeological Survey of Israel (Photo by S. Rosen), 4. Plan of Site 233, 5. Plan of Nahal Tsafit, (Middle Timnian, Chalcolithic Period), 6. Composite photograph of Nahal Tsafit (S. Rosen). Letters indicate same loci in plan and photograph.

also Abu-Azizeh 2013; Goring-Morris 1993; Rosen 1988a and b; Tarawneh and Abudanah 2013). Archaeologically, the remains of these structures consist of low walls of field stone, rarely preserved to more than a crude course or two high. Abu-Azizeh (2013, 2014) lists sites ranging from as small as 113 m² to as

large as 6148 m², but the large sites clearly comprise multiple compounds (Fig. 8.3). The stone walls most likely served as the foundations for brush huts, and probably for brush fences as well. Notably, in the absence of appropriate pack animals and technologies for production of large scale textiles, tents were not yet used, and were not introduced into the desert until end of the second or beginning of the first millennium BCE (Rosen and Saidel 2010). Some sites comprise multiple compounds or enclosures, and radiocarbon dates and both horizontal and vertical stratigraphy at many sites indicate that ad hoc repairs, reconstruction, and multiple phases were common (e.g., Vardi et al. 2014). The enclosures have generally been interpreted as animal pens (e.g., Abu-Azizeh 2013, 2014; Haiman 1992b; Henry 1995:360; Rosen 1988a and b; Saidel and Haiman 2014; Saidel 2002b), and Kozloff (1981) reported on dung present in some of these in South Sinai. This is important, reflecting the integration of herds into the basic architecture of domestic encampments.

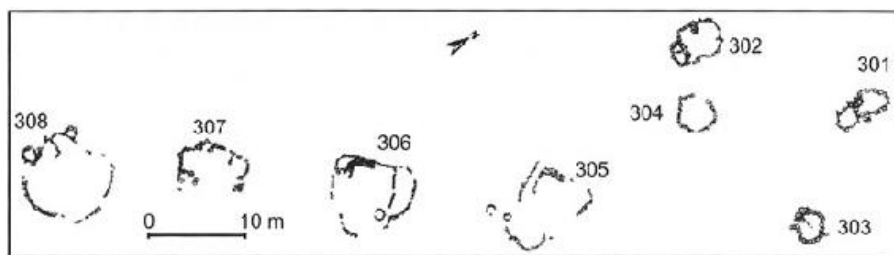


Figure 8.3 Complex of clustered compounds from Early Bronze Age (Late Timnian) Site 29.

Source: Saidel and Haiman 2014:fig. 2130, with permission of the authors.

The general site type is found throughout the southern Levantine deserts, from Jordan in the Black Desert (Tarawneh and Abudanah 2013), through the Jafr Basin (e.g., Fujii 1998, 1999) and north Arabia (e.g., Abu-Azizeh 2013, 2014), through the Negev (Avner 1990; Goring-Morris 1993; Rosen 1984; Vardi et al. 2014), and into Sinai (e.g., Beit-Arieh 1986; Eddy and Wendorf 1999: e.g., figs. 3.3, 3.6, 3.7, 3.10, 3.14, 3.15; Kozloff 1981). Although dubbed the “Timnian”, it is not possible to determine what the true core area of this distribution might be, if there even is one. It is likely that the general adaptation extends much farther than the scope of this work, into modern day Arabia, Iraq, and Syria, and perhaps into the Eastern Desert in Egypt.

Based on intensive survey, Abu-Azizeh (2013, 2014) has analyzed these types of sites in the al-Thulaythuwat area of southeastern Jordan and concluded that variability in area, number of discrete spaces (rooms, pens), surface lithic densities, and micro-locale reflects patterns of pastoral mobility, notably seasonality and population aggregation and dispersion, as well as exploitation of specific resources such as lithic quarries. Henry (1992) has also modelled

seasonal movement within the Timnian using site location, site size (noting a bimodal distribution), and lithic assemblage configurations, suggesting a kind of vertical transhumance from the Jordanian Plateau down into the Rift Valley. Kozloff (1981), based on his surveys of Timnian sites in South Sinai, has also suggested patterns of seasonal aggregation and dispersion based on access to water sources and analogy with recent Bedouin groups. Thus, all concur that Timnian settlement systems were based on patterns of pastoral mobility, perhaps also linked to some types of exchange (e.g., Abe 2008; Müller-Neuhof 2014). The primary drawback to these models is the lack of chronological resolution, all the sites being lumped into a single Timnian entity and dated generally to either the Chalcolithic-Early Bronze Age (Abu-Azizeh 2013, 2014), or implicitly to the longer span of Pottery Neolithic through Early Bronze Age (Kozloff 1981).



Figure 8.4 Google Earth satellite photograph of Bedouin encampment with enclosure and tent, Wadi Hisma, southern Jordan. Palimpsest of earlier occupation(s) can be seen offset from both the tent and the pen.

Source: Capture courtesy of B. Saidel.

In a larger context, the enclosure and attached room type of site (cell and enclosure in Abu-Azizeh's terminology [2013, 2014]) is similar, although not identical, to many types of recent Bedouin pastoral encampments with attached pens (e.g., [Fig. 8.4](#)). It is also rather strikingly structurally similar to East African cattle compounds, although these are, of course, significantly

larger (e.g., Robertshaw 1990:e.g., figs. 13.1, 3, 5, 11; Shahack et al. 2003), presumably due to the herding of cows as opposed to sheep and goats. Regardless, the parallels underline the functional convergences in animal herding between these different societies.

Other features and furniture associated with and attached to these compounds are hearths, platforms, tumuli or cairns, small bins or enclosed loci, and partition walls. In some cases, as in some of the tumuli in the Negev (Saidel n.d.), these features may be the result of later (or earlier) use of the locale, causing the juxta-position of structures. In others, as in hearths, partitions, etc., they clearly comprise functional addenda to the basic pattern of room and enclosure. Ultimately function cannot be reliably defined without excavation and analysis of finds and contexts. Even then, loci are probably not single function, leading into the classic archaeological issues of the interpretation of discard patterns and palimpsests (e.g., O'Connell 1987; O'Connell et al. 1991).

In the absence of enough systematic excavations and radiocarbon assays (with well-published contexts), especially for the earlier phases of the Timnian, dating is difficult. Goring-Morris (1993) dates the compound at Be'er Ada, in the southern Negev, to the 6th millennium BCE based on lithic attributes. Kozloff (1981) reported on radiocarbon dates spanning the 5th through 3rd millennia from Timnian sites tested in South Sinai (published in Rothenberg and Glass 1992: Table 2). Beit-Arieh (2003:275) offers a general 5th–4th millennium date for many of the sites surveyed in South Sinai, and Abu-Azizeh (2013, 2014) indicates a Chalcolithic/Early Bronze span for sites surveyed and analyzed in southeast Jordan, both seemingly based on similar lithic criteria. Avner et al. (1994; Avner and Carmi 2001) have published a number of radiocarbon dates from the 6th millennium BCE from the Negev and Sinai, but only a few, such as Uvda 7, are from habitation sites, and contexts are not clear since there are upper levels to the site which define the architecture. Similarly, sites from Sinai such as Hashem al-Tarif 713 (Rothenberg and Glass 1992) and Sinai 32 (Krolik 1999) also show 6th millennium dates along with later dates. Dates from two excavated Timnian sites in central Negev, Kvish Harif (Rosen 1984) and Nahal Tsaftit (Rosen 2013), both with typical room and enclosure architecture, fall into the late 5th millennium BCE. Vardi et al. (2014) have dated two architecturally typical sites on Har Harif (45 and 47), in the central Negev, to the late 6th and early 5th millennia BCE based on both radiocarbon assays and arrowhead assemblages.

Thus, chronologically the enclosure and attached room type architecture, as a general type, seems to originate in the 6th millennium BCE. Given the reasonable assumption that it is an adaptation to systematic herding, there is no reason to assume a point origin, and the type should be attached to the

general evolution of desert pastoralism throughout the region. Perhaps more significantly, the type continues as a general class of architecture through the end of the 3rd millennium BCE (to be discussed later).

Subsistence

Little direct evidence for subsistence is available for the early phases of the Timnian, in fact, considerably less than that for the preceding PPNC and PPNB. This is partially the result of the fewer excavations that have been conducted for this period, but may also reflect a lesser emphasis placed on the collection of subsistence data in later archaeological periods. In fact, most sites show little depth of accumulation. Flotation at the Camel Site (a late Timnian site, ca. 3000 BCE), with a depth of accumulation at greatest less than 40 cm (and usually less) resulted in few organic remains, and none that could be reliably attributed to ancient times² (Rosen 2011a:10, 12). It is possible that changed patterns of mobility resulting in a general lack of deep accumulation affected preservation, although more effort must be made in this realm.

Beginning again with the Ramon I rock shelter (Fig. 7.2), the Stratum III dung layer (ca. 6200/6000–5000 BCE) presents clear evidence for systematic herding and off-site stabling of herds. The presence of a similar layer of dung in the nearby Ramon IV rock shelter, dated by radiocarbon to the end of the 5th millennium BCE (also with indications of intentional burning), and earlier undated layers beneath it, brackets some 2,000 years of episodes of stabling goats and/or sheep in the general area. In accordance with this, at the early end of the time span, the roughly contemporary Burqu' 27, Phase 2, in eastern Jordan (Betts et al. 2013:95–97; McCartney 1992) shows over 50% sheep and goats in its faunal assemblage. Faunal assemblages from the 6th through 4th millennia BCE are characterized by goats and sheep (e.g., Avner et al. 1994; Henry 1995:368–9), but actual reports are rare at best.

In accord with the rock shelters and the little faunal evidence available, as indicated above there is scholarly consensus that the enclosures integrated into Timnian domestic architecture served as animal pens (Abu-Azizeh 2013, 2014; Henry 1995:359–362, fig. 15.3; Rosen 1988a). Kozloff (1981) reported on dung layers in some of these enclosures. Beyond such functions as herd protection, speculating, the centrality of the caprovines in these early herders' lives is perhaps reflected spatially in the fact that the pens actually lie at the center of the domestic compound. This in fact contrasts with classical period herders' encampments (e.g., Rosen and Avni 1993, 1997), and is not typical of much recent Bedouin settlement.

Beyond the exploitation of sheep and goats for meat, the first ceramic churns appear in the Late Pottery Neolithic (ca. 5000 BCE or perhaps somewhat earlier), implying early dairying in the settled zone (Amiran 1969:33–34; Kaplan 1954). These, of course, become part of the classic Chalcolithic ceramic repertoire (e.g., Garfinkel and Epstein 1999:254–258; Gilead and Goren 1995; Levy 1983). Residue analyses conducted on sherds over a large part of the Near East confirms that these were indeed used for dairy (Evershed et al. 2008). Russell (1988:15–36, 73–107) calculated that the exploitation of dairy products doubled the effective number of calories that could be obtained from herds. Such churns have not been found in Timnian contexts, but ethnographically (e.g., Kaplan 1954), ceramic churns seem to imitate skin vessels, and it is reasonable to assume that dairy exploitation was introduced into Timnian society at some point in the 6th or 5th millennia BCE.

If the development of the Timnian is marked to great extent by the emergence of systematic herding of caprovines, the continued presence of chipped stone arrowheads³ in lithic assemblages in the desert suggests that hunting continued to play a role in desert society, if perhaps no longer the major component in subsistence per se. By the Timnian, the large blade projectile points of the PPNB (and the PPNC) had been replaced by small points and somewhat later, transverse points throughout the Levant, and in the settled zone, this transition is also marked by a decline in the proportion of arrowheads in lithic assemblages, perhaps as early as the PPNC (Figs. 6.2, 6.5; Goring-Morris 1993). The transition to small points should be seen as the result of a set of interacting factors, including the collapse of incipient specialist systems for the production of large blades (e.g., Khalaily 2009 for the collapse; Barzilai 2009 for the incipient specialization), the increasingly common use of pressure retouch for shaping points, a trend independent of the blade technology, the decline of hunting as a primary subsistence activity, and probably other inter-related technological developments. These might include, for example, changes in point hafting technology, the possible introduction of the use of poisons (cf. Clark 1975–77; Clark et al. 1974), and perhaps, somewhat later in the sequence, the introduction of more sophisticated bows⁴ (e.g., McEwen 1998). The decline in arrowhead percentages in the desert seems to begin somewhat later than in the settled zone, perhaps as a result of the later adoption of domesticates. More significantly, the ultimate disappearance of chipped stone projectile points took place more than two millennia later in the desert (Rosen 1997:41), seemingly reflecting the continued practice of hunting well after its virtual disappearance as a significant subsistence activity in the settled zone. Of course, the decline in chipped stone points could conceivably be the result of their replacement by wooden or bone points, but there is no evidence to support such an assumption. Furthermore, arrowheads certainly

may have been used for warfare as well as hunting. However, the convergence of these different patterns begs for a unifying explanation. The rise of pastoralism and the relegation of hunting to a more specialized activity seem to be the most reasonable.

The change in arrowheads may also reflect changes in hunting practice, and the appearance of desert kites ([Fig. 8.5](#)) in this period underscores this idea. Kites⁵ are herd drive traps (Bar-Oz et al. 2011a,b; Helms and Betts 1987; Holzer et al. 2010; Meshel 1974, 1980) usually associated with hunting gazelle, but perhaps also used for driving other animals, such as onager (e.g., Van Berg et al. 2004). Indeed, Avner (2002:130) reports onager bones in a desert kite in Wadi Jenah, South Sinai, dated to the 4th millennium BCE. In general, kites reflect a kind of communal hunt and can be compared to similar animal drives found the world over (e.g., bison drives in North America [Smith et al. 2008] or medieval onager drive traps in central Asia [Yagodin et al. 2007]). Bar-Oz et al. (2011a) have reported large numbers of gazelle bones from a kite enclosure at Tel Kuran, in Syria, indicating mass kills, and claim that the use of kites during the 4th and 3rd millennia BCE resulted in a major decline in gazelle populations.⁶ On the other hand, Echallier and Brae-mer (1995) suggest that kites may have been used more as a means of gathering large numbers of semi-domestic animals, a form of ranching.

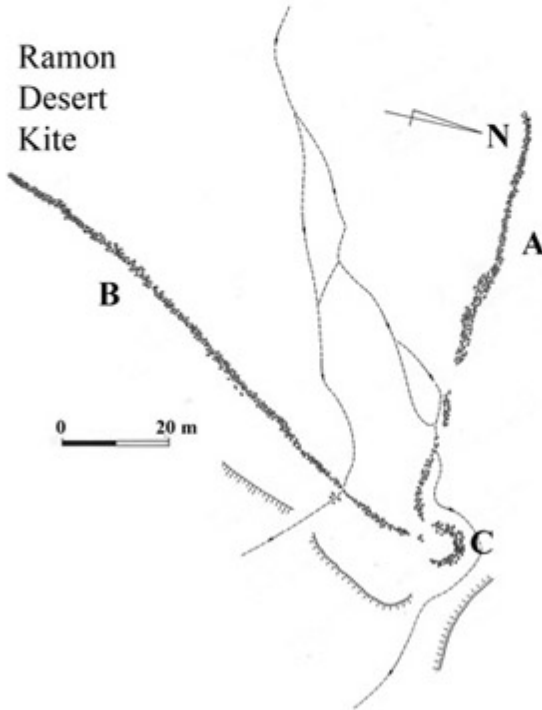
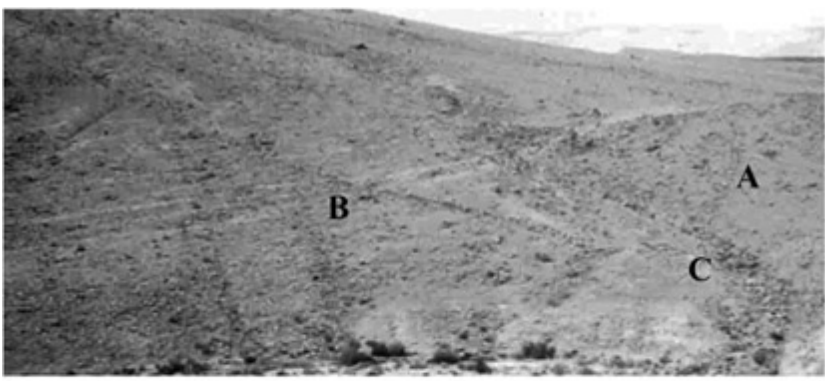


Figure 8.5 Desert kite in the Makhtesh Ramon (Rosen 1994:86–87). A, B: arms of the kite; C, pit or enclosure.

Kites are varied in their form and size (e.g., Echallier and Braemer 1995). Some are quite simple, consisting of two low walls converging to a pit or small enclosure which served as the killing ground (Fig. 8.5). Such small kites may be only 100 m in length. Others may extend for kilometers, forming a chain of attached v-shaped structures with separate enclosures. The enclosures too may vary greatly in size and shape, some small and simple ovals or circles of stone and others large and elaborate structures with substructures and attached rooms, perhaps hunting blinds (e.g., Helms and Betts 1987; Zeder et al. 2013). The compound or chain kites may have been constructed over time. Some of

the variability may have to do with topography, the walls constructed along a slope to funnel down into a pit. The largest kites have been documented in Jordan and Syria, and seem to occur on flatter topography; based on Google Maps survey and other sources, Kennedy (2012) has reported thousands of kites stretching from South Arabia through Sinai, the Negev, Jordan, Syria, and into Armenia. Thus, they are clearly not exclusively associated with the Timnian. In fact, given the presence of many kites in areas more associated with urban society, or at its fringes, it is also possible that animal drives in these areas were conducted by sedentary peoples. Yagodin et al. (2007) have described the industrial nature of medieval onager hunts in central Asia using a structurally more massive variant of kites. In the deserts under study here, they are nevertheless a phenomenon which can be attached to the Timnian and related complexes.

The dating of these is disputed. Legge and Rowley-Conwy (1987) claimed an Epipaleolithic date for use of kites in the mass killing of gazelle based on faunal assemblages from Abu Huyrera, on the Euphrates, but in fact presented no evidence for the use of kites. Betts and Helms (1987) dated the kite at Dhuwaila to the PPNB based on physical connections between the walls of the kite and the occupation site, also noting the very high proportion of gazelle present in the faunal assemblages from the different periods of the occupation; others critiqued this claim on stratigraphic grounds, noting that the kite walls seem to post-date the occupation (e.g., Echallier and Braemer 1995). In the Negev, the earliest dates obtained from a series of test excavations (Holzer et al. 2010) indicate a late 4th–early 3rd millennium BCE date; this is supported by the discovery of transverse lunate arrowheads in the enclosure sediments, artifacts associated with the late Early Bronze I/Early Bronze II (Hermon et al. 2011; also Rosen 1983a). Transverse points recovered from excavations in the kite enclosure by A. Goren at Wadi Mara in South Sinai (pers. comm. cited in Rosen 1997:39) suggest dates in the 4th or perhaps 5th millennium BCE. Kites in Armenia have been dated to the late 5th millennium BCE, also based on arrowhead typology (Gasparyan et al. 2013). Kites have also been depicted on petroglyphs (Hershkovitz et al. 1987; Van Berg et al. 2004; Zeder et al. 2013). Eisenberg-Degen (2010) attributed one such example from the central Negev to the Late Timnian (the Early Bronze Age). Thus, in general, if the precise chronological origins of desert kites are difficult to establish, it is clear that they were being utilized by the late 5th and 4th millennia and into the 3rd millennium BCE, the middle and late phases of the Timnian in the desert. Ethnographic descriptions (Meshel 1974) indicate continued use at least through the 19th century CE. although it is difficult to gauge the intensity of later use.

In the context of desert kites as hunting traps, Avner et al. (2011) have

described a series of installations which are described as leopard traps, based on ethnographic observation. These have been dated by OSL on the quartz grains accumulated within them to roughly the 4th millennium BCE, perhaps somewhat earlier (Porat et al. 2013). That is, they are contemporary with the kites and probably part of a similar assemblage of hunting technologies.

In addition to hunting larger fauna, smaller animals, like hares, were also exploited (e.g., Martin 1999). Furthermore, the presence of ostrich eggshells at various sites without evidence of their use in bead manufacture (in these early phases of the Timnian) suggests collection of eggs for food⁷ (e.g., Betts et al. 2013:122, 129, 146–147).

If the evidence for animal exploitation during the Timnian is limited, there is even less for plant exploitation. Phytolith analyses from the Chalcolithic (Timnian) site at Jebel Jill in southern Jordan (A. Rosen 1995a) revealed a relative abundance of grasses, but no evidence for domesticated cereals. In contrast, on the fringes of the desert in both Jordan and Israel, in the Ghassulian Chalcolithic villages (5th millennium BCE), there is an abundance of direct evidence for farming, including cereals, legumes, grapes, and fruits (Gilead 1988; Kislev 1987; Rowan and Golden 2009; Zohary and Spiegel-Roy 1975). Phytolith analysis at Shiqmim indicates simple floodwater farming of cereals (S.A. Rosen 1987), as well as possible agricultural exploitation of the interfluves, probably only possible in light of the moist episode associated with the period (Katz et al. 2007).

Indirect evidence for plant exploitation is found in the continued presence of grinding stones at most Timnian sites, indicating processing of plant foods. As with the Pre-Pottery Neolithic B, sickle segments are virtually absent from desert sites, although abundant in contemporary sites in the agricultural zones (Fig. 6.3). Of importance is their relative abundance in sites on the desert edge, in the Beer-sheva Basin, both for the Qatifian (e.g., Gilead et al. 1995), and the Chalcolithic (e.g. Hermon 2008). Thus, although one cannot rule out opportunistic farming in the deep desert, the absence of sickle segments strongly suggests that farming was not systematically or intensively practiced.

Cult and Mortuary Sites

Dedicated cult sites and loci, whose specific and primary function is ritual, appear in the desert regions of the southern Levant for the first time in the 6th millennium BCE (Avner 1984, 1990, 2002; Rosen 2015). This considerably postdates the appearance of such sites in the neighboring settled zone, where they appear in the Pre-Pottery Neolithic A and B, several millennia earlier, for

example, as at Jericho (Barkai and Liran 2008; Bar-Yosef 1986; *per contra* Kenyon's [1957] interpretation of the Jericho wall and tower as defensive), Kfar Horesh (Goring-Morris 2005), Gobekli Tepi, to be sure, in Turkey, but impossible to ignore (e.g., Schmidt 2010; and also see Banning 2011 for domestic interpretation still including ritual), 'Ain Ghazal (e.g., Rollefson 2002), Jerf el-Ahmar (e.g., Stordeur et al. 2000), and others. Claims for earlier attributions in the Negev (Avner et al. 2014) and Sinai (Rothenberg 1980:125, fig. 28) are based on faulty associations between the site/locus and the dated materials.

Two basic types of sites can be identified: shrine sites and cairn fields. These are often, but not always, in proximity one to the other. Only a few have been systematically excavated and published, although the dates for these have been remarkably consistent, falling in the 6th and early 5th millennia BCE (Miller 1999; Porat et al. 2006; Yogeve 1983). Many more have been surveyed (Abu-Azizeh et al. 2014; Avner 2002; Haiman 1992a; Rowan et al. 2015; Saidel n.d.), and some have been dated by radiocarbon (Avner and Carmi 2001; Avner et al. 1994), but the contexts have not been published. Avner (2002) documents a range of other types of ritual sites in the Negev and Sinai, such as various kinds of stelae (*massebot*) and other features, but these have been difficult to date with confidence.

The shrines can be characterized in general as open courtyard structures. Although there is some typological variability, they share an open courtyard built of small stones or slabs on the east side of either a central cell or stone pile or long massive wall demarcating the western side, sometimes with a built feature in its center (e.g., Fig. 8.6; also Avner 2002:fig. 5.158). Other features which may occur within or in proximity to the shrines are groups of small stelae, as in the central cell at Uvda Valley 6 (Yogeve 1983), geoglyphs of various animals (interpreted primarily as leopards and gazelles) also at Uvda Valley 6, and at Hashem al-Tarif (Avner 2002:figs. 5.149–155), as well as hearths, and other non-descript and perhaps ad hoc features. Most significantly, alignments are not random. The rectangular shrine type (Figure 8.5; Avner 2002:fig. 5.158), as demonstrated at the Ramat Saharonim shrines (Rosen et al. 2007; Rosen and Rosen 2003), aligns with the setting sun of the summer solstice.⁸ To judge from published survey plans (Avner 2002:fig. 5.158), other shrines of this type align in the same direction, a strong pattern suggesting a specific cosmology (Rosen 2015). The shrines at Ramat Saharonim and Hashem Tarif occur as pairs, with a primary rectangular shrine aligned with the summer solstice, and a few meters to the northwest, square shrines. Avner (2002:117) has interpreted these as paired shrines, male and female. However, stratigraphic excavation of Shrine 4 at Ramat Saharonim (Rosen et al. 2007) indicates that the secondary square structures were constructed significantly later than the larger

rectangles. This, of course, renders the interpretation untenable, at least during the earlier stage of construction and use, but indicates a long tradition of sacred places.

The shrines may occur as single structures, as at Uvda Valley 6 (Yogev 1983) or Ein Zarqa in South Sinai (Rothenberg 1980:11), or in complexes such as Hashem Tarif, in Sinai, with some 19 shrines (Avner 2002:fig. 5:158), or Ramat Saharonim, with four shrines (Rosen et al. 2007; Rosen and Rosen 2003). It appears likely that the sets of shrines were built in series, reflecting long-term use (and ultimately reuse, in the construction of the secondary square structures).

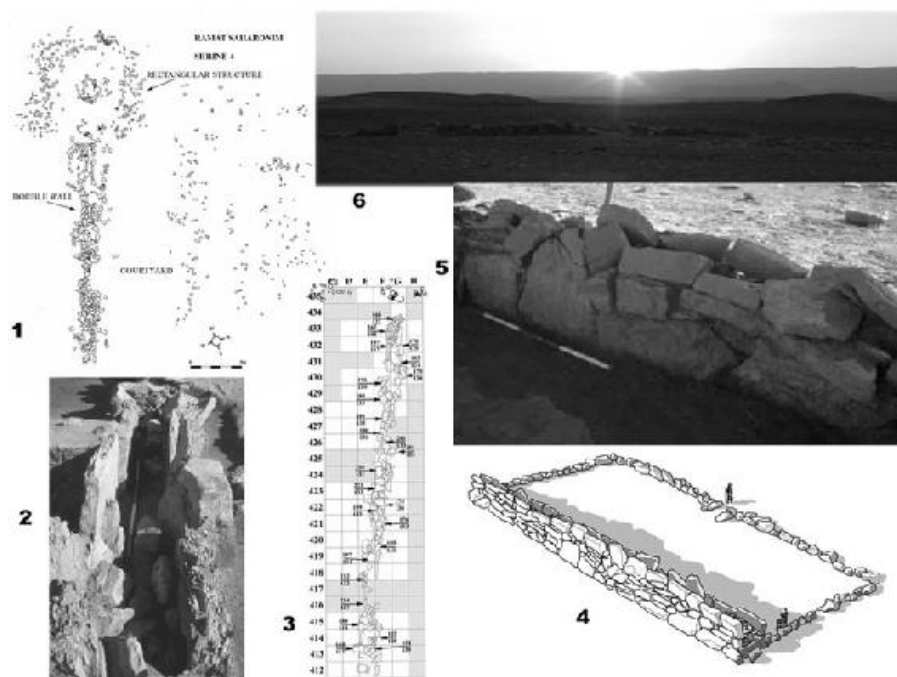


Figure 8.6 Ramat Saharonim Shrine 4: 1. Shrine 4 plan before excavation, 2. Photograph of main (western) wall after excavation, 3. Plan of Shrine 4 after excavation, 4. artist's reconstruction of Shrine 4 facing northeast (H. Sokolskaya), 5. Section of western face of main wall, facing northeast, 6. Sunset on summer solstice, over Shrine 4, facing roughly west northwest.

Cult is also reflected in the construction of large cairn fields apparently contemporary with the shrine complexes. The cairns under discussion here are circular, as opposed to the rectangular cairns generally attributed to the terminal 3rd millennium BCE (Cohen 1999: e.g., fig. 25, 72–73). Most recently, Abu-Azizeh (2014; Abu-Azizeh et al. 2014) has surveyed and excavated some of these fields in the Al-Thulaythuwat/Jabal Kabd region of southeastern

Jordan, and dated them by radiocarbon to the late 6th/early 5th millennium BCE, concurring with previous assessments by Avner et al. (1994; Avner and Carmi 2001) and Porat et al. (2006). On the other hand, Haiman (1992a) dated cairn fields in the central Negev on the basis of proximity to and physical integration with Early Bronze Age settlement sites, but more recent assessment questions that attribution (Saidel n.d.).

The fields vary considerably in size, numbering from as few as 20 at Eilat (Avner et al. 1994) or 30 at Ramat Saharonim (Rosen et al. 2007), to well over 100 at various sites in the Negev (Haiman 1992a; Rosen 2013) and Jordan (Abu-Azizeh et al. 2014). They comprise features which are constructed in locales (ridges, cliffs, rises) designed to be visible from a distance (cf. Tilley 1994). At Ramat Saharonim, the individual cairns do not comprise burials per se, but rather are constructed over built cists enclosing essentially an exposed body or deposited bones, secondary burials (both at Ramat Saharonim and Al-Thulaythuwat). There is some evidence for the excavation of shallow cists at Al-Thulaythuwat. A margin of large stones circles the cist and the tumulus is constructed to fill that stone circle (Abu-Azizeh et al. 2014; Haiman 1992a; Rosen et al. 2007). Although excavation of the cairns required the removal of much redeposited loess, it is clear that these accumulations considerably post-dated construction and use. Access to the internal cist during the period of use was probably a fairly simple matter of cap stone removal, and perhaps the shifting of some additional boulder fill. Treatment of the bodies varied considerably, from primary burials, to secondary burials, and on to skeletal realignments. The cairns may contain remains of single or multiple individuals (e.g., Abu-Azizeh et al. 2014; Rosen et al. 2007), probably deposited at different times. Haiman (1992a) reported that the vast majority of his excavated cairns were devoid of bones, suggesting perhaps removal of remains. Burial goods were rare at all sites. At Ramat Saharonim, four *Conus* shell beads, apparently an anklet, were recovered from a single skeleton. A single metacarpal from an equid was also recovered, suggesting the possibility of either some kind of offering, or perhaps feasting (Horwitz et al. 2011), as associated with recent Bedouin Saints tombs (for an ethnoarchaeological example, Yekutieli 2007). Abu-Azizeh et al. (2014) recovered only a single bead and a point from four cairns excavated at Al-Thulaythuwat/Jabal Kabd.

The cairn fields are often associated with other phenomena. At Ramat Saharonim the field was clearly integrated with the shrines, as was that at Eilat (Avner 1994), and another at Nahal Tsafit (Rosen 2013). Abu-Azizeh et al. (2014) note the co-occurrence of various other features, such as rectangular platforms, which may be regional variants of shrines of one kind or another. Other areas of Jordan, such as Maitland's Mesa, are not yet fully documented, but show similar phenomena (Rowan et al. 2015).

Somewhat later, in the late 5th and 4th millennia BCE, similar practices are evident in the Nawamis fields of Sinai, especially at Ein Hudera and Gebel Gunna (Bar-Yosef et al. 1977, 1986). The Nawamis are large, cylindrical, corbel-vaulted tombs, ca. 5 m in diameter and 2 m high, built of uncut stone slabs (Fig. 8.7). They house multiple burials, occur in large fields composed of dozens of structures, and are found in several areas of southern and central Sinai. The material culture recovered from these tombs suggests a Chalcolithic through Early Bronze I attribution (late 5th through 4th millennium BCE). Bar-Yosef et al. (1983; also HersHKovitz et al. 1985) have suggested that variation in doorway orientation, assumed to align with the setting sun, reflects season of burial, and can be used to infer seasonality as well as cosmology. Farther afield, in eastern and southern Arabia, the tower tombs and other burial features offer a similar narrative of elaborate pastoral burials and fields, if perhaps somewhat later (e.g., Belmonte and González-García 2014; Giraud and Cleuziou 2009; Steimer-Herbet et al. 2006).



Figure 8.7 Nawamis tombs at Ein Hudera. *Source:* Photo courtesy of B. Saidel.

Material Culture

The material culture of the early and middle phases of the Timnian culture complex varies chronologically. It is dominated throughout by the lithic

industry, but milling stones and beads are present in some numbers. By the end of the 5th millennium BCE, ceramics have been added to the repertoire, as has copper. Other small finds have also been recovered.

Lithics

Technologically, lithic production is based primarily on small flakes struck from amorphous or ad hoc cores (e.g., Kozloff 1973; Rosen 1984, 2011c). Cores are small and generally amorphous, rarely exceeding 8 cm in maximum dimension; they often show multiple platforms. Deliberate core trimming elements are rare to absent, although mistakes (hinged flakes, overstrikes, etc.) are common. Flakes are correspondingly small, often with pronounced bulbs of percussion. Direct hard hammer percussion is the dominant mode of removal. Flake:core ratios are high, varying between roughly 20:1 and 100:1 for the periods under discussion, indicating relatively intensive on-site exploitation of predominantly local raw materials (e.g., Rosen 1984). Although some of the cores can be classified as blade or blade-let cores, the general technology, based on reduction of pebbles (for example, at Nahal Tsafit), suggests that blades and bladelets were produced as variants or byproducts of the general flake *chaîne opératoire*. It is difficult to define standardized blade or bladelet industries, in contrast to the preceding PPNC/Early Pottery Neolithic industries, and for that matter, contemporary industries in the settled zone. Two other *chaînes opératoires* are also evident in the tool assemblages, a large flake industry producing tabular scrapers and a core tool industry, producing rare axes/adzes. Debitage from these *chaînes opératoires* is virtually absent on habitation sites, although in retrospect possible rough-outs for adzes were present at Kvish Harif (Rosen 1984:fig. 11:1–2). Small quarry or workshop sites for tabular scrapers have been found in the Negev and Sinai (Rosen 1983b, 1997:75), but very large quarry sites have been documented in Jordan, especially in the Jafr Basin (Abe 2008; Fujii 1998, 1999, 2011; Müller-Neuhof 2013; Quintero et al. 2002). Tabular scrapers were produced from large lens-shaped nodules (Fig. 8.8) or blocks of flint, using either a block-on-block technique or (large) hard hammer. Striking platforms are sometimes faceted. The original cores were for the most part then discarded, left on site (Fig. 8.8; Quintero et al. 2002). Once the large cortical flake was removed, it served as the blank for later modification, which took place elsewhere, either in secondary workshops, as at Wadi Gaza A,⁹ where large unmodified blanks were found in an apparent cache (Macdonald 1932:11, pl. xix, 6; Roshwalb 1981:39–45, 1987; also Fujii 2011 for cache from Wadi Qusayr, in Jordan), or perhaps directly by individual

consumers. Axes/adzes were produced either on smaller, lens-shaped nodules (true core tools), or on large flakes; there does not seem to be a relationship between the production of tabular scrapers and that of axes/adzes, and the tabular scraper quarries do not show blanks which might naturally be exploited for the production of celt tools. That is, the production of tabular scrapers comprised a discrete reduction system, reflecting the special functions and economics of these tools.



Figure 8.8 Tabular scraper cores from Har Michia. A. General landscape view south-southeast, B. Tabular (fan-) scraper core on flint lens-shaped nodule, single removal, C. Tabular scraper core, multiple removals on block of flint, D. Cluster of tabular scraper cores, single and multiple removals, on nodules and blocks.

Timnian lithic tool assemblages are comprised of arrowheads, a range of blade tools, microlithic drills, various awls and borers, other scrapers, and a large proportion of ad hoc tools—notches, denticulates, choppers, and retouched flakes—tabular scrapers, and occasional axes/adzes. Burins, which are common in the PPNB and some PPNC assemblages, became increasingly rare in Timnian assemblages. As above, with the exception of the tabular scrapers, and axe/adzes, all tools derive technologically from variants within a single *chaînes opératoires*. Tools were produced on site, and with the exception of the tabular scrapers, there is little evidence for any kind of specialized manufacture, in contrast to trends in the settled zone.

As described above, there is a general long-term trend toward reduction in the relative numbers of arrowheads in desert assemblages (Fig. 6.2). In addition to this, typological trends suggest changes in technology and also offer chronological markers (Fig. 6.5). Thus, if in the 7th millennium BCE (PPNC), the Amuq and Byblos points (and variants) continue, and are joined most notably by the small points (especially Herzliya and Nizzanim points, the small counterparts to Amuq and Byblos points [Gopher 1994:39–41]), by the early stages of the Timnian, the large points drop out, small points continue, and transverse triangular points are added to the repertoire. By the mid 5th millennium BCE (Middle Timnian), triangular transverse points dominate numerically; by the mid 4th millennium, in the Sinai, these appear to have been displaced by rectangular or trapezoid transverse points (also Betts et al. 2013:93–94, at Burqu’ 27000, upper layers), in turn ultimately replaced by microlithic lunates at the end of the 4th and 3rd millennium BCE, in the Late Timnian. Reiterating, this sequence is unique to the desert; in the settled zone, chipped stone arrowheads of all types have virtually disappeared by 5000 BCE, if not somewhat earlier (arrowheads are notable in their absence from these reports and analyses of Late Neolithic and Chalcolithic assemblages, e.g., Abadi-Reiss 2009; Gilead et al. 1995; Gopher 1994; Roshwalb 1981, 1987). Several meanings can be attached to these trends. Most obviously, as indicated above, hunting continued as a significant activity throughout the Timnian, in spite of the emergence of systematic herding. In the absence of any evidence for specialized manufacture, either in dedicated technologies or spatially on habitation sites, the arrowheads were most likely produced by the hunters themselves. Finally, the material culture divergence between the desert and settled societies is well evident in the different trajectories of arrowhead typology and frequency.

A similar developmental continuity can be traced in the tabular scraper family, beginning with the Tuwailan or PPNC bifacial knives and variants like tile knives, the technological and perhaps functional predecessors of the tabular scrapers, typical of Late Pottery Neolithic, Chalcolithic, and Early

Bronze Age industries (Rosen 1997:71–79). Tabular scrapers (Fig. 8.9) are large primary flakes whose cortex is deliberately retained, sometimes ground, and in the Early Bronze Age (beginning in the 4th millennium BCE), often incised with various symbols (Fig. 8.10). Retouch modifies the edge of the flake. The tools were produced in the desert periphery and imported into the settled zone as part of a pastoral exchange system (e.g., Abe 2008; Fujii 2011; Müller-Neuhof 2013; Quintero et al. 2002; Rosen 1983b, 1997:106, 109). Functionally they are the subject of some debate. Although assigned the rubric “scraper”, McConaughy’s (1979:304, 1980) microwear analyses on tabular scrapers from Bab edh Dhra indicate that they were

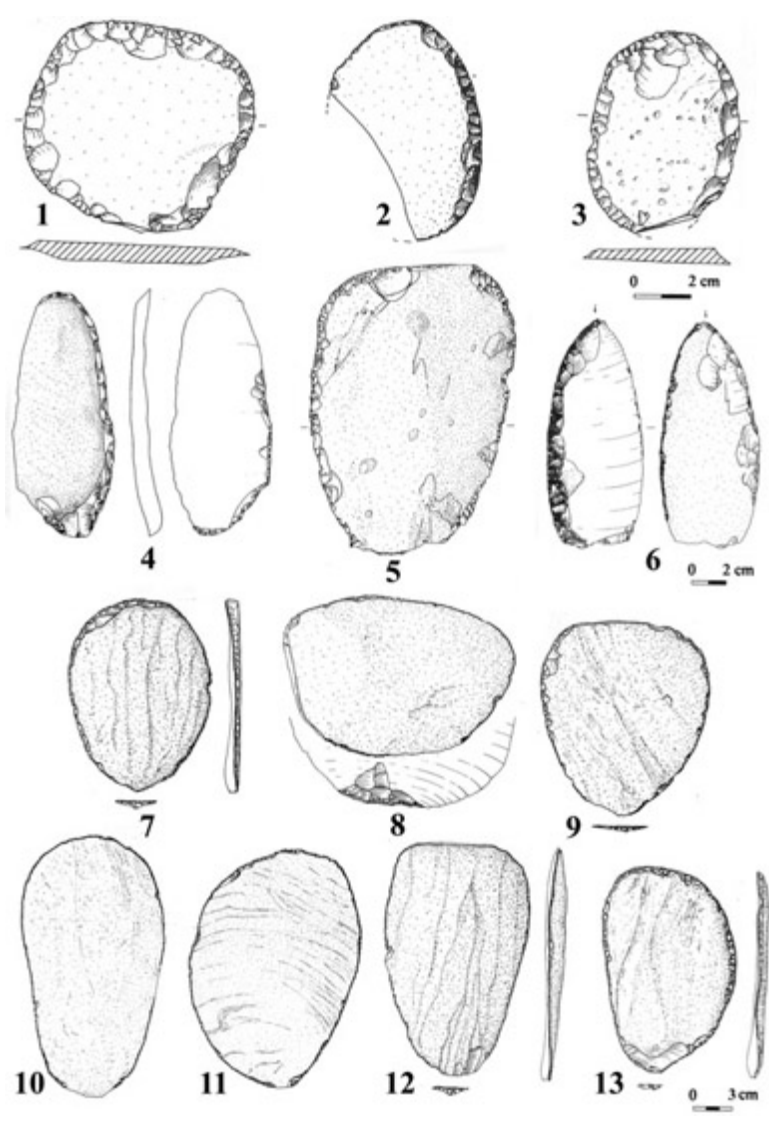


Figure 8.9 Tabular scrapers. 1, 3. Nahal Nizzana (Burian and Friedman 1987:fig. 2); 2, 4.

Shiqmim (Levy and Rosen 1987:fig. 10.5), 5. Har Qeren (Rosen 1997:fig. 3.32), 6. Beit Yerah (Rosen 1997:fig. 3.32; 7–13), from cache of 39 tabular scrapers found in Tumulus Site 695, South Sinai.

Source: Excavated by B. Rothenberg.

knives used on meat. The combination of high value (as reflected in their import from some distance and their relative scarcity in the settled zone), symbolic loading (especially in the various designs incised on the cortices), and contexts, often cultic or ritual (Rosen 1997:75), suggests ideological or ritual function. Shimelmitz and Adams (2014) have noted their presence, and apparent sharpening, in the sacred precinct at Megiddo. Claims that they were used as sheep shears (Barket and Bell 2011; Bennett et al. 1989; Henry 1995:372–373) have been based on

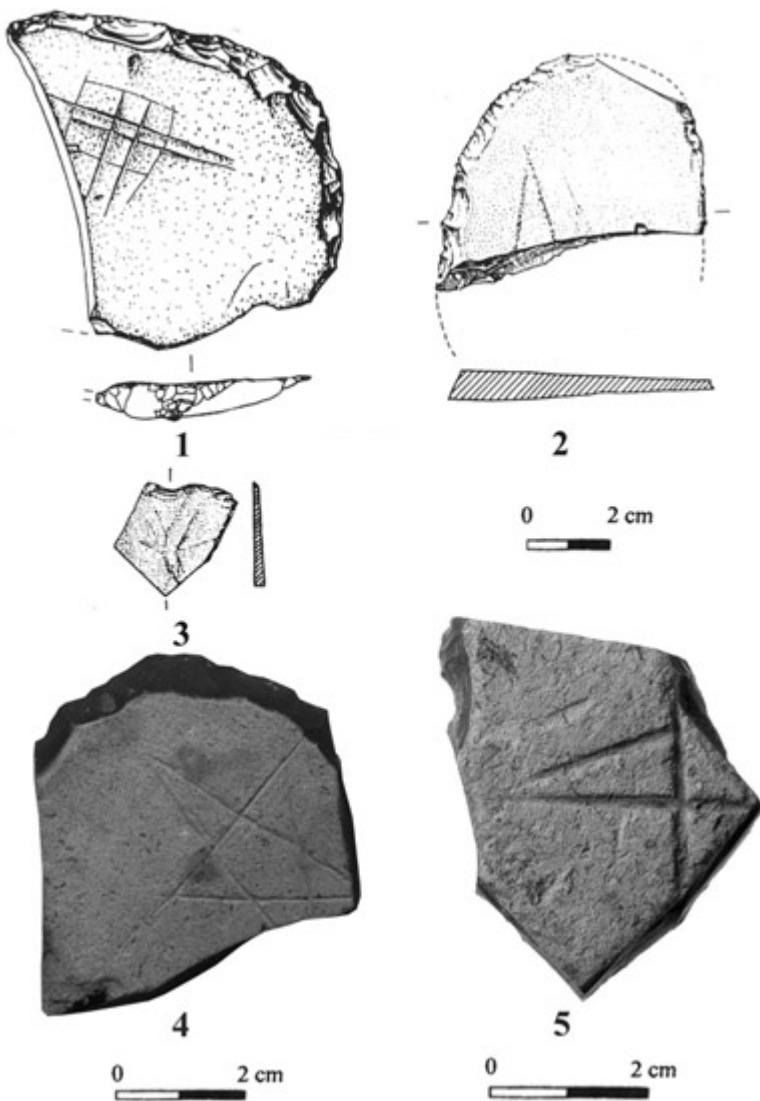


Figure 8.10 Tabular scrapers (fragments) with incised symbols. 1. Tell Qasis, 2–4. Tel Yarmouth, 5. Gezer.

Source: 1–3., Rosen 1997:fig. 3.34; 4. Courtesy of P. de Mirsochedji, 5. Photograph by A. Fogel, Ben-Gurion University.

replication and experimental work, but are flawed; although it is possible to shear sheep with tabular scrapers, the tools pre-date systematic exploitation of sheep for wool (Levy and Gilead 2012). Furthermore, it is not clear why such valuable objects, imported from afar, would be preferred over large-blade tools, well available for example in the Early Bronze Age. Notably, Shoh Yammada (personal communication) has suggested that some of these tools were intentionally broken in the course of ritual. The retention of the cortex, and

rejection of other types of flakes for shearing tools, is also left unexplained. It should be noted that in the desert systems, the tools seem to play more mundane roles in cutting and other ad hoc functions, perhaps “leftovers” from trade items, or re-used following loss of ritual meaning after use.

Axes and adzes are also an important component of early and middle Timnian assemblages (e.g., Rosen 1984; Vardi et al. 2014). Given the scarcity of trees, they were not used for forest clearance, but most likely for woodworking, reducing the small-scale wood available in the desert, as reflected in microwear studies from sites beyond the desert (e.g., Barkai and Yerkes 2008; Yerkes et al. 2003). Some show polished edges. Given the near absence of these tools in desert PPNB sites, their presence in Timnian assemblages likely derives from some form of contact with the settled zone; one cannot rule out the possibility, although they seem unlikely to have been trade items.

The blade tools include backed blades, simple retouched blades, and rare glossy blades (e.g., Vardi et al. 2014). This, of course, stands in considerable contrast to the abundance of sickle blades in contemporary northern assemblages. Blades are not standardized, again, in contrast to northern types (e.g., Gilead et al. 1995).

Microlithic drills, found both in cache sites (e.g., Burian and Friedman 1987) and occupation sites as at Nahal Tsaftit (Fig. 8.11: 1–4), were used in bead making. Other borers and awls were apparently used for engraving or making holes. Beyond these pointed tools, the set of ad hoc tools was used for general domestic purposes.

Grinding Stones and Stone Artifacts

As indicated above, grinding stones are found in low numbers in most sites. They remain basically similar in typology and technology to those of the preceding periods, consisting of basal stones and smaller rubbers (metates and manos). At Kvish Harif (Rosen 1984), two of the three (fragments) were made of sandstone, found in the adjacent *Makhtesh* Ramon, and the third was of limestone. In eastern Jordan, in the upper layers of Burqu’ 03000, Betts et al. (2013:60) note the presence of many ground stone tools, and circular and sub-circular querns. At Burqu’ 27000, milling stones are made of basalt, not surprising given the proximity to sources. Avner (2002:16) collected some 400 grinding stones, upper and lowers, in his survey of the Uvda Valley, many deriving from Timnian sites. These were predominantly made of hard sandstones, ferruginous or metamorphized, the most obvious source of both

being the *Makhtesh* Ramon. There is also sandstone available in the Timna area, but whether these specific raw materials are present there has not been determined. Clearly, these artifacts reflect seed or grain processing, the gathering part of the herding-gathering economy.

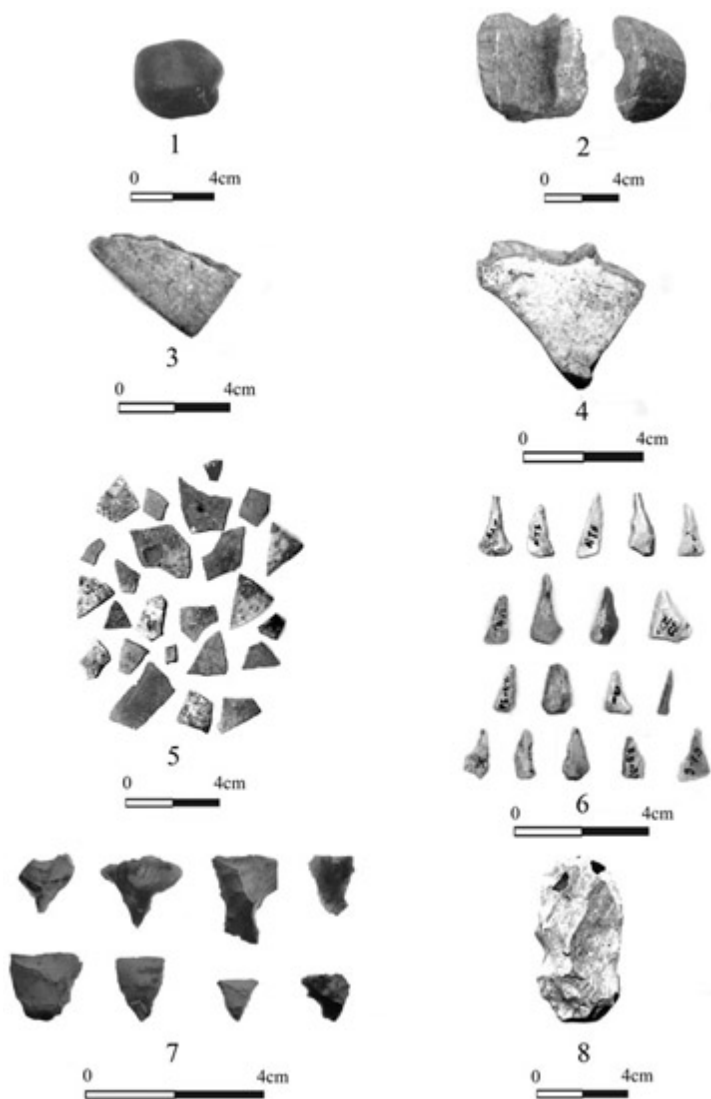


Figure 8.11 Finds from the Middle Timnian site of Nahal Tsafit. 1. Hematite nodule, 2. Limestone mace head fragment, 3–4. Tabular scraper fragments, 5. Ostrich eggshell fragments, 6. Microlithic drills, 7. Transverse arrowheads, 8. scraper.

Other stone artifacts found in Timnian sites include limestone rings (especially at the Burqu’ sites) and stone mace heads, as at Burqu’ 27000 (Betts

et al. 2013:88) and Nahal Tsafit (Fig. 8.11:5). The rings suggest continuities with the preceding chronological phases (Betts et al. 2013:57–60, 88, 146, 185), whereas the mace heads are of especial importance since they are also typical of the contemporary Ghassulian Chalcolithic in the settled zone (e.g., Rosenberg 2010).

Beads

Beads are a common component of Timnian and pre-Timnian assemblages (e.g., Bar-Yosef Mayer 1997, 1999:77–133, 2005). The assemblages from the southwest Sinai sites Wadi Jibba II and Ila (Bar-Yosef Mayer 1999:fig. 3.12), early Pottery Neolithic, have seashells and seashell beads deriving almost exclusively from the Red Sea (Bar-Yosef Mayer 1999:77–133; also Gopher 1994:141). For the early and middle Timnian, through the 5th and 4th millennia BCE, the Red Sea continues to be virtually the only source of shells for both South Sinai (Bar-Yosef Mayer 1997, 1999; also Bar-Yosef et al. 1977, 1986) and southern Jordan (Reese 1995). However, Bar-Yosef Mayer (1999:69, 127) also notes that the configuration of the shell assemblages changes from the PPNB to the Timnian. While *Dentalium* and *Conus* continued in common use from one period to the other, *Nerita* and *Cypraea* were replaced in importance by *Lambus truncata* and *Pinctada margaritifera*. In South Sinai the shell assemblages derive in large numbers from the nawamis tombs, which seem to show less diversity but much greater density than associated habitation structures (Bar-Yosef Mayer 1999:77–133). Red Sea shells also appear, in low frequencies, in both Chalcolithic and Early Bronze Age I sites in the Mediterranean zone (Bar-Yosef Mayer 1997), indicating transport north, presumably through the Timnian cultural medium.

Beads of other materials have also been identified. These include ostrich eggshell, turquoise, carnelian, copper, and bone (e.g., Bar-Yosef et al. 1977, 1986; Bar-Yosef Mayer 1997, 2005; Goring-Morris 1993). Avner (2002:77) found beads of seashells, faience, steatite, and greenstones in the 6th–5th millennia BCE Eilat burial ground and the Eilat V tomb; not far away, at the Ma'aleh Shaharut tombs, he recovered beads made of dentalium, bone, sea shell, and faience. At Jebel Naja, in eastern Jordan (in the Azraq region) and dating to the terminal 7th millennium BCE, Betts et al. (2013:17) documented a bead-making locus, with holed marine shells and stone beads. Cooke (2013) notes at least three different stone raw materials at the site, corresponding to different colors: pink calcite, green Dabba marble (apatite) and buff/white, several different stones. The technology of production required mechanical drilling, presumably

bow drills. Bead making is present also at Qa'al al Ghiqra (in the Azraq region), where the arrowhead assemblage of small points and transverse points suggests 6th–5th millennia BCE. At Burqu' 03000, dated to the early 6th millennium BCE, beads of both stone and shell were manufactured, and at Burqu' 27000, stone beads, shells, mother of pearl, dentalium, and cowrie shells were recovered (Betts et al. 2013:88–89). Recent investigations at Maitland's Mesa and other sites (Rowan et al. 2015) have also discovered large quantities of beads, probably attributable in general to the Timnian, although they have yet to be reliably dated. Finally, the presence of various stone beads in the settled zone during Late Neolithic and Chalcolithic times, whose mineral origins lie in the desert or beyond (e.g., Bar-Yosef et al. 2004 for steatite found at the Chalcolithic site of Peki'in in the Galilee; Abadi-Reiss 2009:5, 76–77 for beads at Qatif, in the Northern Negev), indicates trade connections based on semi-precious items.

Pottery

Although the Pottery Neolithic period in the north is most noted, as its name implies, for the initial appearance of ceramics associated with the Yarmukian Culture¹⁰ (e.g., Gopher and Gophna 1993; Stekelis 1972), there is no clear evidence for ceramic technology in the south until significantly later. In the northern Negev, at the middle Timnian site of Nahal Tsafit (ca. 4000 BCE), a large holemouth cooking pot was discovered, virtually intact, but lacking both base and most of the rim (Fig. 8.12). For the Central Negev and farther south, the first ceramic assemblages, usually consisting only of a few nondescript sherds (whose affinities are always suspect), seem to date at earliest to the southern equivalent of the Chalcolithic, as at the central Negev site of Kvish Harif (Rosen 1984). Farther south, at roughly contemporary sites in the Uvda Valley and Timna, ceramic assemblages are either absent, as at for example Nahal Issaron upper stratum (Goring-Morris and Gopher 1983), or rare (Avner 2002:6, 13). Rothenberg and Glass (1992) suggest a chronological sequence for the Timnian based on ceramic petrographic variability, but not on typology. This has been critiqued methodologically by Sebbane et al. (1993), although they agree with the general conclusions concerning cultural continuities in the desert.

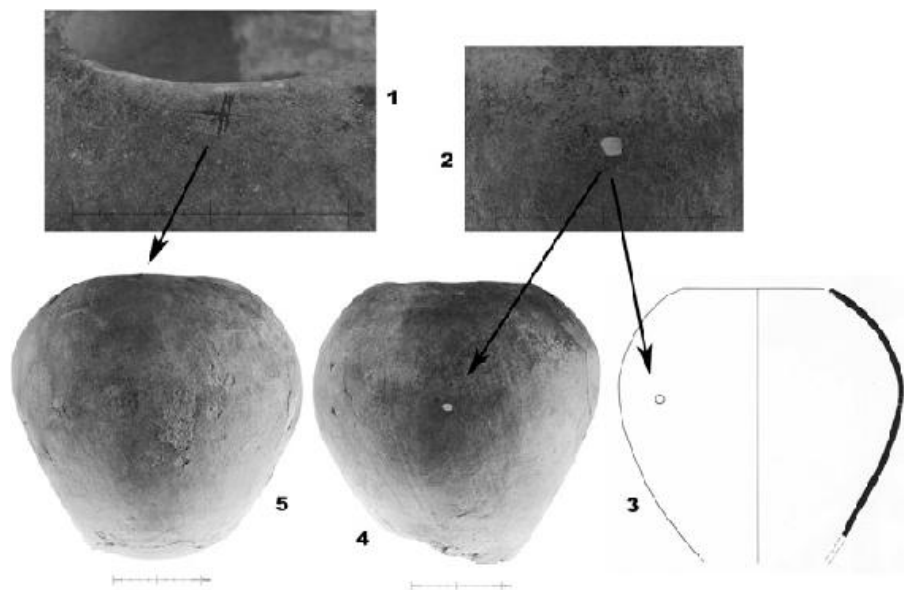


Figure 8.12 Holemouth jar from Nahal Tsafit. 1. Potter's mark on lip of jar, 2. Deliberate hole in side of jar, 3. Profile, 4. Side of jar with hole, 5. Side of jar with mark.

The elaborate ceramic assemblages of the late Pottery Neolithic Qatfian culture (ca. 5000 BCE) of the northwestern Negev (Abadi-Reiss 2009; Gilead 1990) did not penetrate farther south than the dunes of the western Negev. The distinctive Ghassul-Beersheva Chalcolithic ceramic assemblages, including pithoi, basins, v-shaped bowls of various sizes, cornets, and churns, penetrated only slightly farther south, to the Nahal Sekher area (Gilead and Goren 1986), Wadi Zalzal Cave (Cohen 1999:20), and the Dead Sea area, Nahal Mishmar or Ein Gedi (e.g., Gilead 1988). Cohen (1999:15–36) dates some sixteen surveyed sites to the Chalcolithic period in the Central Negev (covering an area of ca. 8000 km²). However, the primary index fossil seems to be axes/adzes, not pottery, and the distinction between Ghassulian and Timnian is not made. Most of the sites seem to be Timnian. The absence of ceramic assemblages attributable to either variants of the Qatfian or the Ghassul-Beersheva complex in Wadi Feinan,¹¹ in spite of the strong evidence linking these copper sources to the copper objects of Ghassul-Beersheva, remains a conundrum, one solution to which would be the Timnians as metal traders (e.g., Tadmor et al. 1995). The Timnian site of Nahal Tsafit (Rosen 2013), halfway on the road between Beersheva and Feinan, with basalt-tempered pottery (undoubtedly from Feinan), supports such an interpretation.

The first real ceramic *assemblages* in the south, as opposed to small sets of nondescript sherds, appear around the middle of the 4th millennium BC (calibrated). Thus at Serabit el Khadim (Beit-Arieh 1980),¹² a large number of

nawamis and nawamis occupation structures (Bar-Yosef et al. 1977, 1986), Timnian sites (Kozloff 1981), and sites in the Central and southern Negev (Beit-Arieh 2003:309, 314, 327, 330; Rothenberg and Glass 1992, etc. for ceramic illustrations from survey sites; Sebbane et al. 1993) contained holemouth jars and cooking vessels, and occasional pieces reminiscent of Early Bronze Age I Arad.

Copper

Copper metallurgy makes its first appearance in the region ca. 4200 BCE (Shugar and Gohm 2011), in association with the Chalcolithic cultures of the northern Negev and farther north (e.g., Golden 2010; Shugar and Gohm 2011). With the exception of one apparent smelting locus from Site 39 in Timna (Rothenberg 1972:27–51), dated by radiocarbon to the Chalcolithic, early and middle Timnian sites are without evidence for smelted artifacts, although occasional beads have been found (Avner 2002:54). As indicated above, this poses an as yet unresolved question, the source and mechanism for the evolution of Levantine Chalcolithic metallurgy. Copper implements in the Ghassul-Beersheva Chalcolithic are based on a variety of sophisticated casting techniques (e.g., Key 1980; Levy and Shalev 1989) and a range of ores (or alloys) (Tadmor et al. 1995; Shalev 1991), and include cult objects (e.g., “scepters”, “crowns”, mace heads) and more domestic tools (axes, awls). The cult objects dominate. The complex copper-arsenic-antimony alloys, used in the lost wax objects, are not found naturally in Feinan, and have usually assumed to derive from Armenia (e.g., Shugar 2001). On the other hand, the objects themselves were cast locally, as evident petrographically in the local clays used for the cores of the lost wax object (e.g., Shalev et al. 1992). Thus, either ingots or ores were likely transported from some distance, perhaps analogous to the contemporaneous movement of obsidian, about which there can be no doubt as to source (e.g., Yellin et al. 1996).

The apparent copper entrepôts in the Aqaba area (Brückner et al. 2002; Khalil and Schmidt 2009) add another dimension to the Timnian involvement in copper metallurgy. These sites date to the late 5th through mid 4th millennia BCE and will be discussed in more detail in [Chapter 9](#) (the later phase similar in its ceramics to Wadi Fidan 4, in Feinan).

Rock Art

5000 BCE

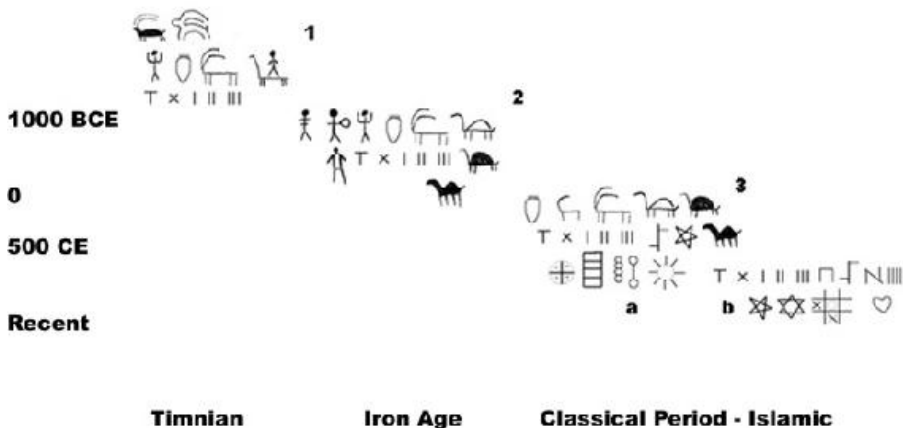


Figure 8.13 Sequence of rock art complexes with schematic chronology. *Source:* Modified from Eisenberg-Degen and Rosen (2013).

Systematic and quantitative analyses of some 8000 petroglyphs in the Central Negev from two sampled locales, Har Michia and Ezuz (Eisenberg-Degen 2012; Eisenberg-Degen and Nash 2014; Eisenberg-Degen and Rosen 2013), have demonstrated a chronological sequence in Negev rock art. Based on superposition of petroglyphs and relative shades of patina on single panels with multiple motifs, as well as cautiously applied absolute shades, three general chronological (and overlapping) clusters or modalities of motif types can be defined, with the latest divisible into two sub-clusters for a total of four. Based on chronologically known datum points, such as the appearance of complex bows, ridden camels, and written inscriptions (using both the specific language and content of the inscriptions and the epigraphy), this sequence can be anchored in specific time periods. Thus, trivially, the latest cluster, with Arabic inscriptions, clearly dates to medieval times, with the latest sub-cluster representing recent Bedouin rock art. Contradicting previous assessments suggesting the presence of Paleolithic rock art (e.g., Anati 2015), the earliest rock art complex from the areas studied in the central Negev (Fig. 8.13) is attributed to the period equivalent to the Timnian culture complex, partially due to the presence of ridden donkeys in the cluster, introduced into the general region no earlier than the 5th and probably in the 4th millennium BCE (e.g., Ovadia 1992 for the domestication of the donkey). It is not yet possible to determine where in the Timnian sequence the bulk of the art falls.



Figure 8.14 Ibex petroglyphs typical of the Timnian from Har Michia North. Note the later petroglyphs, with lighter patina, attributable to Phase 4, Classical and Recent.

Source: Photo courtesy of Davida Eisenberg-Degen.

The content of this earliest cluster is meaningful. It is characterized by a specific and relatively limited set of motifs (relative compared to later clusters which seem to show greater diversity), especially by ibex (e.g., [Fig. 8.14](#)), some types of anthropomorphic figures (including the apparent donkeys being ridden—they are clearly not camels, which are well evident in the later phases), and abstract figures. The rock art does not reflect daily life or subsistence and representations of sheep, goats, flora, and other aspects of day-to-day life are virtually absent. Hunting scenes are not unusual (Eisenberg-Degen and Nash 2014) and at least one representation of a kite was discovered in the survey area (Eisenberg-Degen 2010). Eisenberg-Degen (2012:293–345) suggests that the primary function of the rock art is thus symbolic, representing various levels of group and personal identity, and functioning to maintain those identities. The coincidence of the emergence of rock art with the crystallization of the Timnian culture complex cannot be accident, and in fact, it should be seen as integral to that process.

Revolution in the Desert: Integrating Processes in the Timnian Culture Complex

The Timnian Culture Complex described above, that is, the earlier half of the complex, spans more than two millennia, from ca. 6000 BCE to the end of the 5th and into the 4th millennium BCE. Although it has been heuristically described as a unit, there is nothing static about the Timnian and it encompasses a dynamic complex of social and cultural change. If the processes which brought about the formation of the Timnian complex, expressed in the

archaeological attributes reviewed above, operated at some level in an integrated fashion, correlated causally one with the other, there is both chronological and geographic variation in the way they operated.

Chronologically, the following sequence can be outlined, from early to late (Table 7.1):

1. Ca. 6200–6000 BCE the herding of goats and sheep (or perhaps sheep drop out of the mix at some point) in the desert periphery transforms into a specialized adaptation, different in essential form from both the evolution/adoption of barnyard animals into village society (cf. Arbuckle 2014; Makarewicz 2013) and from the annexation of domesticates into the hunting-gathering economy. This is seen earliest in the exploitation of rock shelters as non-residential stabling loci, reflecting both larger herds (in order to actually achieve a dense layer of dung), and the need for external stabling, presumably with goatherds/shepherds *sensu stricto*. Systematic, if not necessarily intensive, exploitation of dairy products seems to begin in the late 6th millennium BCE, a major expansion of the potentials of sheep and goat herding.
2. Perhaps contemporary with this, perhaps somewhat later, the pen-and-attached-room architecture develops. The precise dates are difficult to pin down in the absence of extensive excavations with dates from good contexts. Beyond the enclosures/pens as an architectural adaptation to pastoralism, these compounds suggest a change in social organization. The spatial organization contrasts with both the PPNB clusters and the varying PPNC architectures, and indicates a change in intra-group relations. It is hard to define this without resorting to difficult speculation; if clustered structures, abutting one another, represent intense social interaction, a cohesion engendered directly by propinquity, the separation engendered by placing a large open space between many of the actual domestic structures, cells in Abu-Azizeh's (2013, 2014, Abu-Azizeh et al. 2014) terminology, must have meaning in terms of social space and social relations. Beyond the apparent centrality of the herds spatially (and it is worth noting that there are pastoral societies, such as later pastoral groups in the desert, which do not show spatial centrality of the herds in their architecture), the separation, and indeed the lower number of huts in most of these compounds than are found in PPNB sites, suggests different notions of group cohesion. Domestic herds, unlike wild animals, are owned, even in the most egalitarian of pastoral societies. The spatial changes evident in the architecture may well be a reflection of new ideas concerning ownership and space relating to ownership.

3. Other architectural innovations seem to occur somewhat later. The rise of monumental shrines, really megaliths in conception, occurs in the mid-6th millennium BCE, post-dating the shift to systematic herding, and perhaps somewhat later than the changes in domestic architecture. The rise of monumental mortuary sites, the tumulus or cairn fields, is contemporary with that of the shrines. These features evolve over time, incorporating chronological variation such that, for example, the subsidiary structures to the main shrines are added significantly later, and nawamis tombs in Sinai are a millennium later than the tumulus fields.
4. The ultimate abandonment of the large arrowheads occurs in the late 7th or early 6th millennium BCE, with the rise of small points. These are later supplanted in importance by transverse points, perhaps in the 5th millennium BCE. As above, at one level this seems to reflect a change in the skill sets required for large blade production; it may also reflect a change in the role of arrowheads and the declining importance of game hunting.
5. The transition from tabular knives to tabular scrapers parallels the changes in projectile points, occurring sometime in the 6th millennium BCE. Incised symbols on the cortex of these tools appear only in the 4th millennium BCE. In general, the trade in these large flake tools seems to intensify through the Late Timnian.
6. The Phase I rock art complex appears perhaps as early as the 6th millennium BCE, but more likely somewhat later.
7. The earliest desert kites in the region can be dated to perhaps the 5th millennium BCE, although they too may appear somewhat earlier.
8. The earliest ceramics in the deep desert (as opposed to the agricultural desert fringes) penetrate in the late 5th millennium BCE.
9. Metallurgy arises in the late 5th millennium BCE.

Given this chronological dynamic, the Timnian is not really the polythetic set of co-occurring attributes (cf. Clarke 1978:363–408) that one usually associates with the definition of an archaeological culture. Rather, it is the set of integrated processes entailed in the rise of systematic desert pastoralism. Around 4000 BCE (the precise date here is semantic given the dynamism), a new set of processes, comprising intensive ties to the settled zone and the beginning of economic asymmetries and dependence relationships, begins to evolve. The initial stimulus seems to have developed around the demand for copper. This will be explored in the next chapter.

The integrated processes indicated above require greater discussion.

Trivially, the adoption of systematic herding entails changes across the entire range of a society. Ingold (1980) has described some of these effects on northern reindeer herding societies, in northern Finland, as they moved from hunting reindeer to herding them, noting the ideological differences between hunters and herders, and suggesting differences in settlement systems, especially in the rise of tethered systems associated with herding. No direct comparison between the substance of the reindeer herding system in the cold desert of Finland and the adoption of sheep and goats into the hot deserts of the Near East is intended, but the need to adjust all aspects of a culture from hunting to herding as a primary occupation is common to both processes.

In light of the chronological coincidence of the 8.2 kya event, that is the dry-cold episode dated to ca. 6200 BCE ([Chapter 5](#)), with the initial crystallization of the Timnian as defined here, the issue of the relationship between climatic change and culture change should be addressed. First, the two pollen samples obtained from Stratum III of the Ramon Rock Shelter,¹³ one upper and one lower, suggest that the lower sample represents a drier climate than the upper sample, but the dominance of chenopods in both indicates aridity regardless. Phytolith analysis of the sediments which are exclusively dung remains indicates exploitation of wet-lands, either springs or well-watered wadis from this stratum (A. Rosen et al. 2013). Although it is likely that any adoption of herd animals into the desert hunter-gatherer system would have ultimately entailed the changes outlined above, the 8.2 kya event seems to have acted as a trigger, perhaps in reducing the density of browse and necessitating pasturage farther afield, perhaps indeed to the point of off-site stabling. Similarly, the water sources in eastern Jordan were probably reduced, requiring adjustment. Kozloff (1981) modeled the Timnian as a system of dispersal and aggregation around seasonally available water sources. The 8.2 kya event may have emphasized and accelerated the adoption of such patterns.

The link between the enclosures-and-attached-room architecture and herding is obvious. Beyond this, the implications of the architecture *vis à vis* group cohesion hint at deeper changes. Herds constitute capital (cf. Black-Michaud 1986), even if they do not necessarily attach to a market system. Ethnographically they are owned by households, not bands or larger corporate entities. Indeed, the mere fact that they are owned, that they are property, fundamentally distinguishes herding from hunting (cf. Ingold 1980); thus, both the centrality of the herds in the basic lifeways of herders and the change in relation to subsistence resources. If households become the primary focus of economic life, as opposed to bands, then the architectural shift in fact is a consequence of both the adoption of herds and the change in social structure concomitant with that shift.

The evolution of centralized cult, in particular the construction of megalithic

tombs and shrines, can be linked to these changes in subsistence and social organization (Rosen 2015). If the adoption of herds can be seen as a form of privatization, in a loose sense, one of the ramifications of privatization is increased territoriality (e.g., Meir 1996). Indeed, this should not be surprising given that once herds are owned, the resources required for their maintenance, pasturage and water, become crucial. Furthermore, in terms of resource exploitation, the adoption of herds constitutes a major population increase, if not strictly of people, nevertheless in terms of bodies that must be fed and watered, this implying increased competition for resources. Although privatization is usually associated with recent market-based processes, in turn tied to household-based land ownership, in the earlier contexts of the transition to herding, and in the absence of real market forces, both megaliths and cemeteries, cairn fields, can be interpreted as expressions of increased tribal territoriality, reflecting intensification of corporate identities (e.g., Kinnes 1982; Kristiansen 1984; Renfrew 1984) as a function of the need to defend territory at levels beyond the individual household, perhaps some early hint of lineage-based organization. Among recent Bedouin in the Negev, cemeteries indeed mark tribal territories (e.g., Galili and Kark 2011; Meraiot 2011, 2013:206–211), and, of course, these tribes are indeed segmented lineages based on territories (e.g., Marx 1977).

Territoriality is one face of a more complex coin. The construction of megaliths, both the large cairns and the megalithic shrines, constitute the first appearance of monumental architecture in the desert. As earlier, the total mass of a single shrine at Ramat Saharonim is estimated to be ca. 30 tons, dragged a distance of some 300 m, with some blocks weighing perhaps as much as half a ton. There are four shrines and 30 cairns. Although this complex was not built in a single episode of construction, and in some senses it does not comprise a truly great amount of labor,¹⁴ it nevertheless presents a major contrast in labor organization with preceding periods. That is, again basic change in social organization is evident, with hints at hierarchy in the need for leadership to construct such monuments.

Finally, the complex *public* cosmology is also to be noted. All human groups have complex ideologies and belief systems, but not all groups express their systems in monumental structures. These monuments represent a physical manifestation of a changed social order. At the simplest level, they represent territory and power relations, but more subtly, a monumental cosmology constitutes a public declaration and legitimizes those relations by appeal to the heavens—the shrines and cairns are social tools for maintaining and legitimizing the new social order, crucial in light of the apparent breakdown in the preceding band-level social order represented by, among other things, the beehive or clustered architectural patterns.

Like the shrines and cairns, rock art carries symbolic loading. The appearance of the Phase 1 rock art complex coincident with these social changes is part of the general process of establishing new social order. In the case of the Negev rock art, Eisenberg-Degen (2012:281–292 for three tiers, 293–345 for interpretations) suggests that different levels of stylistic expression reflect different levels of individual and group identity, the rock art serving as boundary markers, individual messages, and general markers of cultural affinity. The point is that these appear as part of the formation of the Timnian complex, integrated with the evolving social order.

If the appearance of desert kites, apparently somewhat later in the sequence, does not have the symbolic loading seen in the domestic architecture, shrines, and rock art, it nevertheless reflects the same changes in social structure. If the mass killing of gazelles during the Natufian (Legge and Rowley-Conwy 1987) must certainly reflect coordinated community efforts (and it is not clear at all that the desert Natufians can be compared to those of Abu Hureyra or other northern sites [cf. Munro 2004]), the construction of desert kites effectively tethers those communities to specific points in the landscape. They may be compared to fishing weirs amongst the Northwest Coast Indians who stake out fishing territories along a river for exclusive use during the salmon run (e.g., Stewart 1977). These reflect a complex economy, with layers of social and economic integration. Kites not only reflect community hunting, but also advanced planning and territory, perhaps ownership. Furthermore, given the lesser importance of hunting for subsistence during the Timnian, the social importance of such a community effort is foremost. That is, by the time kites are integrated into Timnian society, they not only represent the changes in community structure, but their use actively reinforces that new structure.

Finally, Timnian material culture assemblages can be divided analytically into two categories, indigenous and adopted. Essentially, the lithic, bead, and milling stone assemblages evolved *in situ*. They were locally manufactured on local raw materials, and are fundamentally local in conception. Indeed, the Timnian marks the divergence of desert culture from those of the agricultural regions. Even if many of the desert artifacts are actually traded into the settled zone, in terms of the production systems, functions, and patterns of discard, that is the *chaînes opératoires* of the material culture, assemblages of the desert societies differ from those of their sedentary cousins. Specifically, Timnian production systems remain household based, tied to a fundamentally domestic economy, Sahlin's (1972) domestic mode of production. Even those objects produced for export—knives, tabular scrapers, some beads, etc.—were produced in what should be described as cottage industries.¹⁵ In contrast to emerging economic complexity in the settled zones, there is little evidence for any complex division of labor or internal production specialization. Although

chipped stone quarrying and manufacture and bead making included “experts” and export activities, neither intensity of production nor dependence on production is reflected in these systems in the first half of the Timnian complex, again marking divergence with the sedentary zones. The divergence is evident chronologically as well, in different functional and typological trajectories, especially evident in the arrowheads.

In this context, none of the above materials traded into the settled zone are truly bulk goods. Prior to the domestication of pack animals, for which goats and sheep do not truly qualify, heavy and bulky goods would have been hard to transport (cf. Ovadia 1992; Rosen and Saidel 2010).¹⁶ On the other hand, with the possible exception of basalt milling stones (and it is not clear that these actually traveled very far, given the proximity of basalt sources in Jordan), all qualify as the movement of “preciousities”, tied to identity and affinity (cf. Wright and Garrard 2003 for the earlier stages of the Neolithic).

The adopted material culture assemblages comprise copper and ceramics. Indeed, the copper trade in its earliest configuration may well have been Timnian, but the classic Ghassulian copper objects, the axes and the cult objects, are not found in the early and middle Timnian material culture assemblages (nor, for that matter, in the later stages), which contained copper beads and perhaps awls; the development of copper metallurgy was a function of demand from the settled zone. It is notable that both copper and pottery are adopted late in the sequence, no earlier than mid 5th millennium BCE and likely even later. They represent the increasing ties with the settled zone at the end of the period under discussion here, the forerunners of a new dynamic. Even the copper ores moving from the desert into the northern Negev Chalcolithic can be measured in only kilograms and tens of kilograms, and probably did not move in large packets of 100s of kilograms. The copper objects themselves were not traded in bulk—there are simply too few of them to justify such a reconstruction.

Conclusions: The Rise of Desert Tribal Society

Anthropologically, if the tribe comprises a social configuration located between band-level societies and chiefdoms (Parkinson 2002), not related to linear culture-evolutionary frameworks, then the emergence of the Timnian Culture Complex represents the development of the earliest tribal societies in the deserts of the Near East. In the Timnian Complex we see changes in basic

organization, adding new layers of social structure and tools for the maintenance of social order. Furthermore, the Timnian Culture Complex should not be seen as a static entity, but comprises a dynamic set of integrated processes tied to adapting small-stock pastoralism to living in the desert.

In summary, domestic goats and sheep were assimilated into hunter-gatherer systems in the period ca. 7000–6000 BCE; this seemingly revolutionary change in subsistence seems to have effected only gradual change in other aspects of desert society, in fact crystallizing only in the two millennia from 6000–4000 BCE. The ultimate potentials of domestic herds for intensification of production seem not to have been exploited for millennia, dependent on the social changes, the social tools, required to truly adapt to a changed subsistence system, in essence a higher trophic level of exploitation. Returning to the issues reviewed in the introductory section of this chapter, if at some level the introduction of domestic herd animals into the desert system acted as a trigger, that trigger was effective as such only in a much larger social and ecological context. There is no single prime mover here, but rather a set of circumstances and interrelated processes operating in concert.

Notes

- 1 Recent excavations at Har Harif (Vardi et al. 2014), some 15 km west of the Ramon I Rock Shelter, have documented the closest known occupation sites dated to this period.
- 2 One radiocarbon date, of 4, from the site was modern, and another seems to be anomalous (Rosen 2011a:60).
- 3 Beyond arrowheads as a reflection of hunting, as earlier, Goring-Morris (1993) links the bifacial knives mentioned to animal butchery and the rise of pastoralism (see discussion in Chapter 7).
- 4 The bow discovered in the Cave of the Warrior, in Wadi el-Makkukh, is a single-piece bow. Nevertheless, the double curving indicates a sophisticated and effective weapon.
- 5 The term “desert kite” was given these structures by British pilots flying over the region in the early 20th century who saw a resemblance to kites in the long tails.
- 6 On the other hand, the decline in number of gazelle bones in archaeological faunal assemblages need not reflect gazelle populations in the wild, but rather, changes in patterns of human consumption.
- 7 One cannot rule out their use for containers, although pieces with evidence for appropriate sized holes, or decorative elements as in earlier periods, have not been recovered.
- 8 Of course, an alignment toward the setting sun of the summer solstice is also an alignment toward the rising sun of the winter solstice. However, the geography and indeed

phenomenology of the Ramat Saharonim shrines, built to line up the setting sun of the summer solstice with a large black extinct volcano seen between two low hills, above the north wall of the *Makhtesh* Ramon (Rosen et al. 2007; Rosen and Rosen 2003), cannot be accidental and clinches the case for the summer solstice symbolism.

- 9 It is notable here that the Wadi Gaza sites are part of the sedentary village agricultural systems of the Late Neolithic and Chalcolithic. That is, unworked blanks were imported into the sedentary system and worked into their final form after export from the desert.
- 10 Pottery seems to have been manufactured during the PPNB, for example at Kfar Horesh (Biton et al. 2014), but seems to be ad hoc, scarce, and certainly not systematic production.
- 11 The initial attribution of Wadi Fidan 4 to the Qatifian was later revised and the site is now attributed to the Early Bronze I (Genz 2000), akin to the ceramics from the Aqaba sites (Brückner et al. 2002; Kerner 2009).
- 12 Beit-Arieh (1980) attributes the site to the Chalcolithic, but Stager (1992) assigns it to the Early Bronze Age I.
- 13 Pollen analysis was conducted by A. Babenki of the Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia.
- 14 If one estimates the quarrying, transport, and construction of between half a ton and a ton of rock per person per day, then the total labor for the construction of a single shrine would be between 30 and 60 man days.
- 15 The characterization of the tabular scraper trade system varies, some claiming it is essentially industrial in scale (Müller-Neuhof 2013, 2014; Quintero et al. 2002), others suggesting a less-intensive form of production and exchange (Rosen 1983b, 1997:109), although all agree it was attached to a desert tribal system. Regardless, at this early date of the Timnian, given the overall very low proportions of tabular scrapers imported into the Wadi Raba (Late Neolithic) and Ghassulian (Chalcolithic) assemblages, and well prior to the rise of cities in the Levant, production cannot have been large scale.
- 16 The movement of massive basalt bowls tens of kilometers during the Natufian and later (e.g., Rosenberg and Nadel 2014) is an important cautionary tale, but comprises a fundamentally lower scale of exchange in terms of numbers than seen later, in Early Bronze Age exchange of milling stones (e.g., Abadi and Rosen 2008; Rosen and Schneider 2001).

Another Revolution

The Late Timnian, the Early Bronze Age, and the Rise of Economic Asymmetry

Introduction

The rise of complex societies in southwest Asia during the 4th and 3rd millennia BCE is accompanied by major changes in the societies of the periphery. The transition from subsistence level herder-gatherer to pastoral nomad, in the sense of complex dependence relationships with the settled zone, is well reflected in the archaeological record, and comprises major changes in external relations, economics, and settlement. In essence it is in this period that one can trace the rise of specialized pastoral nomadism in asymmetric core-periphery economic structures which will continue to characterize the phenomenon throughout the millennia. Although the primary focus of this essay will be on the Negev and its neighbors in Jordan and the Sinai (Fig. 9.1), it is no coincidence that assays in explaining the rise of pastoral societies in other parts of the Near East, notably Mesopotamia and Iran, have focused on similar phenomena (e.g., Alizadeh 2008, 2010; Lees and Bates 1974; Porter 2004, 2012; Sumner 1986).

Chronologically, this transition to pastoral nomadism is difficult to pin down. The endpoint of the process is a system of complex economic relations between desert tribal groups and sedentary urban systems, including their village satellites. This system establishes new demographic thresholds in the desert and new dynamic exchange systems ultimately culminating in core-periphery interactions in the sense of exchange of raw materials from the periphery to the core, and processed products of various kinds from the core to the periphery (e.g., Wallerstein 1974 for the general model, and especially Algaze 2005 for world systems applied to Uruk and Mesopotamia). This system is well in place by the early 3rd millennium BCE in the Negev, in the relations between the town of Arad in the northern Negev and the Late Timnian culture

in areas farther south, as well as in relations between Jawa, in the Black Desert, and its desert hinterland (Helms 1981, 1987; Müller-Neuhof 2014). Other cities on the fringes of the desert seem also to reflect similar desert-sown interactions (e.g., Abe 2008; Abu-Azizeh 2013).

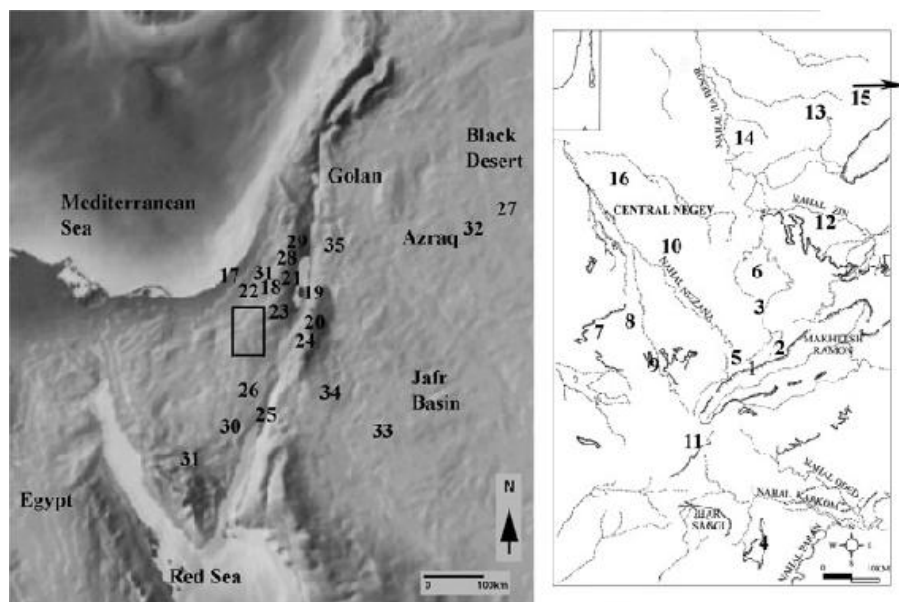


Figure 9.1 Map of site locations for Chapter 9. 1. Ramon 1 rock shelter, 2. Camel site, 3. Rekhes Nafha, 4. Mount Karkom, 5. Kvish Harif, 6. Ramat Matred sites, 7. Qadesh Barnea sites, 8. Nahal Mitnan, 9. Har Horsha, 10. Be'er Resisim, 11. Ein Hameara, 12. Ein Ziq, 13. Har Yeruham, 14. Mashabe Sade, 15. Har Sayad, 16. Nahal Nizzana 103, 17. Gaza, 18. Arad, 19. Bab edh Dhra, 20. Numeira, 21. Mitzpe Shalem, 22. Beersheva, 23. Nahal Tsafit, 24. Feinan, Wadi Fidan 4, 25. Aqaba, Tall al-Magass, Hujayrat al-Ghuzlan, Eilat, 26. Uvda Valley, 27. Jawa, 28. Hebron, 29. Jericho, 30. South Sinai Aradian sites, Sheikh Mukhsen, Nebi Salah, Sheikh'Awad, 31. Tell Hesi, Tell Halif, 32. Dhuwaila, 33. Wadi el-Thuwaythuwa, 34. Jebel el-Jill, 35. Hesban.

The starting point is more difficult to pin down. If new patterns of trade are the key to comprehending the transition, then the development of demand for copper in the Ghassulian villages in the settled zone ushered in this new set of relations in the late 5th millennium BCE (the Chalcolithic and its equivalent Middle Timnian Phase). On the other hand, if the demographic jump evident in the desert in the Late Timnian is the real evidence for economic expansion beyond subsistence herding, then the starting point is much later, perhaps the end of the 4th millennium BCE, and is probably tied to the rise of urban markets in the settled zone. In reality, of course, both issues are crucial.

The Late Timnian: A Description

Systematic excavations and surveys of 4th and 3rd millennium desert encampments offer insights into the chronology and structure of Late Timnian society. Much of the material is similar to the preceding Middle and Early Timnian phases,¹ and the continuities are also evident; hence the inclusion into the same overall cultural entity. Thus, general patterns of architecture and settlement systems are similar to those of the earlier phases, although there is a clear demographic expansion, evident in number of sites and greater areal distribution. Large aggregation sites are also evident in this period. Mortuary cult continues to be evident throughout the desert regions and offers significant contrast with behaviors in the settled zone. The Timnian rock art assemblage cannot be subdivided and seems to reflect a general long-term continuity, perhaps achieving a peak in the Late Timnian. Like the earlier phase, subsistence is focused on herding of small stock, sheep and goats, although in the Negev there seems to be evidence for greater use of desert kites. Agriculture is evident in some microenvironments, and in others one may perhaps posit import of grain. Lithic technologies and other components of material culture show continuity, with some typological change through time. The basic structures of material production remain on the household level, although there is now clear evidence for systematic production for export reflecting intensification of exchange systems clearly tied to the development of market centers; nevertheless, these systems remain at the level of cottage production. The domestication of the donkey played a role here, allowing transport of massive goods, like milling stones. Finally, the impact of the settled zone and its political dynamics on Late Timnian society is much more evident than for earlier phases.

Domestic Architecture and Settlement

The enclosure-and-attached-room compound remains the dominant architectural motif for Late Timnian settlement (e.g., Cohen 1999:39–66; Haiman 1992b; Henry 1995:359–362, fig. 15.3). As with earlier periods, it is found throughout the study region. Although detailed typologies have been constructed for analyzing this architecture (e.g., Abu-Azizeh 2014), these have been interpreted primarily as reflecting patterns of seasonality (e.g., Tarawneh and Abudanah 2013). No chronological trends have been discerned between the various phases of the Timnian with respect to the basic configuration of enclosure and attached rooms. The exception occurs in the Terminal phase, in

the late 3rd millennium BCE, which comprises a major change (see discussion at the end of this chapter and [Chapter 10](#)).

On the other hand, internal phasing within individual sites is well evident. Excavations at the Camel Site (Rosen 2011a:33–58) show internal phasing and a dynamic of architectural repairs and modifications which could not be parsed into actual occupation phases. In fact, even a cursory examination of the many site plans available from this period from all over the regions under discussion (e.g., Abu-Azizeh 2014; Saidel and Haiman 2014) suggests the likelihood of such patterns of use, indicating numerous returns to specific sites, a site-tethered settlement system.

Beyond these patterns of use and repair, Saidel (2002b) has documented the existence of a sterile layer between the Late Timnian (Early Bronze II) and Terminal Timnian (Intermediate Bronze Age) layers at Rekhes Nafha, in the central Negev. At Uvda Valley Site 917 (Beit-Arieh 2001; Rosen 2001), ceramics, lithics, stratigraphy (both vertical and horizontal), and spatial analysis of artifacts reveal two general and relatively discrete phases of occupation/use and reuse in the Late and Terminal Timnian (EBII and EBIV=Intermediate, etc.). Indeed, survey (e.g., Anati 1986:47, 88, 92) of many sites in the central Negev reveals such discrete phases of use and reuse during the 3rd millennium BCE.

If individual compounds show little conceptual change from phase to phase within the chronological span of the Timnian, Haiman (1992a, b; Saidel and Haiman 2014:7–58; also Cohen 1999: e.g., map 3, photographs 16, 18, 21, figs. 25, 29, 41) has documented large clusters of Early Bronze Age II compounds, Late Timnian, in the higher areas of the west central Negev. He offers a typology of sites based essentially on size, and suggests that these clusters represent seasonal aggregations of pastoral groups (cf. Abu-Azizeh 2014; Tarawneh and Abudanah 2013).² These aggregates are of a scale not seen in earlier periods, suggesting a new layer of social organization, tribal groups of a larger scale than evident earlier.

In addition to these permutations of the enclosure-and-attached-room compounds, two sites in the Aqaba region, Tall al-Magass and Hujayrat al-Ghuzlan (Brückner et al. 2002; Khalil and Schmidt 2009), show dense aggregations of rectilinear architecture with proper stone walls and complex stratigraphies indicating relatively intense occupations, in clear contrast to typical Timnian sites. Radiocarbon dates indicate occupation ca. 4000 to 3600 BCE in two phases, with the primary occupation dated to the mid 4th millennium (Eichmann et al. 2009; Khalil 2009; Klimscha 2009). Copper ingots and molds (Hauptmann et al. 2009; Klimscha 2011) and ceramics (Kerner 2009) indicate connections with the copper-producing region of Wadi Feinan, and affinities to the site of Wadi Fidan 4, also dated mid 4th millennium BCE.

Other artifacts indicate connections to Egypt and the Levantine Mediterranean zone (Klimscha 2011). Various installations including check dams, drainage channels, and basins indicate early variants of run-off irrigation farming (Heemeier et al. 2009; Siegal 2009), clearly the only kind of agriculture that could be practiced in this environment, and the presence of glossy blades indicates reaping (Herling 2002a,b; Hikade 2009), confirming the practice of farming. The lithic assemblages are dominated by tabular scrapers (Herling 2002a,b; Hikade 2009). All in all, the Aqaba sites seem to reflect an external presence in the midst of Timnian territory, albeit right on the coast, roughly at the transition from Middle to Late Timnian.

By the late 4th millennium, other external architectures appear in the Negev and Sinai. Rectilinear broad room structures, often with internal benches and sometimes with supporting pillars, and with stone fall indicating stone construction to roof height (Beit-Arieh 1986:29–45, 2003:107, 443–444; Haiman 1992a, b; Haiman 2014:173), contrast with the architecture of the indigenous Timnian (Beit-Arieh 1986; cf. Amiran et al. 1973; Beit-Arieh and Gophna 1976, 1981). These “Aradian” buildings and their variants are architecturally similar (but not identical) to houses at the town of Arad, in the northern Negev (Amiran et al. 1997, Amiran et al. 1978; hence the term “Aradian”). Sometimes they appear as lone structures (e.g., Beit-Arieh 2001; Beit-Arieh and Gophna 1981) and sometimes part of courtyard clusters, as especially in South Sinai (e.g., Beit-Arieh 2003:101–109). It is important here to distinguish between the courtyard structures, as found at Arad and consisting of rooms and an area enclosed by a high stone wall proper, and the Timnian enclosures or pens of the desert, whose stone walls probably did not exceed 50 cm in height. These two types are conceptually different, the former suggesting some concern for private space in an urban environment (perhaps an ancient prototype for modern Near Eastern houses [cf. Canaan 1933; Kramer 1982:fig. 2.1]), and the latter, enclosing area, but not necessarily restricting view, suggesting a fundamentally different function. Furthermore, the deliberate closure of space in Timnian sites, as reflected, for example, in the low closure walls between rooms at the Camel Site (Fig. 9.2),

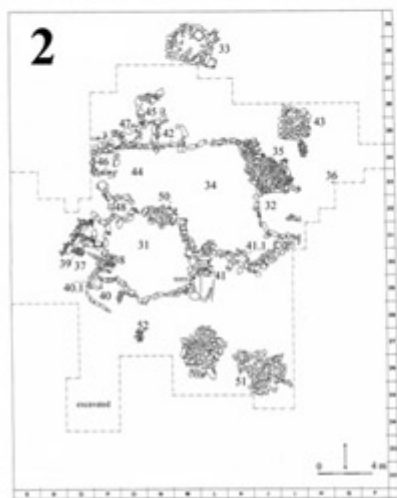


Figure 9.2 The Camel site. 1. Photograph after excavation (S. Rosen), 2. Site plan, 3. Artist's reconstruction (H. Sokoloslkaya). Selected loci indicated for comparative reference.

indicates that the central space between the peripheral rooms of these sites was not merely a central activity area, but required physical closure. Of course, this is obvious given the previously discussed pen function.

Although the presence of “Aradian” sites in Timnian territory has been attributed to an episode of “colonization” based on ceramic petrographic connections, copper slag, and evidence for production, and other material culture connections (e.g., Amiran et al. 1973; Porat 1989 especially for ceramic connections), most scholars view them as trading outposts (e.g., de Miroshedji 1986; Stager 1992) connected to the copper trade and indeed linked to Arad

(Beit-Arieh 2003:440, 442–444; Ilan and Sebbane 1989).³ In this they seem to reflect a phenomenon conceptually similar to the Aqaba sites, although they are later and connect up to a different kind of economic system.

Subsistence Systems

Late Timnian subsistence was based primarily on pastoralism, with important additions from opportunistic agriculture, gathering, and perhaps exchange of food goods. Animal bone assemblages from two Late Timnian (Early Bronze II) sites in the Negev (Horwitz 2014), Har Sagi 9 and 10 (nisp = 117 and 17 respectively, MNI = 7 and 4), are totally dominated by sheep/goat, comprising over 98% of the bone assemblage, and only goat has been identified to species level. Other remains include possible ibex, hare, and a large animal, either a cow or an equid. The bone assemblage from the Timnian site of Jebel Jill in Jordan shows 74% sheep/goat bones, and the remainder from gazelle (Henry 1995:368–369; also Henry et al. 1985); the presence of micro-lithic lunates (e.g., Rosen 1997:42–44) suggests a late 4th/early 3rd millennium BCE date for the site, that is roughly contemporary with the Har Sagi sites. The presence of a single *Bos* tooth is difficult to evaluate. At Ein Hudera Nawamis 315, one gazelle horn core and one capra horn were found, and an additional gazelle core was found in Nawamis 31 (Bar-Yosef et al. 1977). The nawamis, of course, were burial structures, not habitation sites. The Aqaba sites (Benecke 2009) also show a dominance of sheep/goat (67%), but also show cattle (10%), equids (14%), most likely asses whose domestic status is unclear, as well as gazelle, hartebeest, and ibex (together 10%). The presence of cattle and equids contrasts with typical Timnian assemblages. Aradian sites in Sinai also show a dominance of goat, but seemingly no sheep (e.g., Beit-Arieh 1981; Horwitz 2003b; Horwitz and Tchernov 1989), as well as low numbers of gazelle and ibex. In addition to goats, bones of a hare were found at Gunna 32 (Horwitz and Tchernov 1989), and ostrich eggshell fragments have been found at many sites, presumably for large omelets as well as the shell bead material (e.g., Rosen et al. 2011:148). Notably, no assemblage has enough bones to generate reliable statistics concerning culling patterns, seasonality, etc., although the presence of a range of body parts at most sites (e.g., Horwitz and Tchernov 1989) suggests on-site slaughter. Given the nature of Timnian sites as basically surface campsites, the low numbers of bones is not surprising.

Intensive pastoralism is also evident in rock shelter deposits. Resting directly above the Neolithic dung layer at the Ramon I rock shelter lies a 60 cm layer of dung deposits with 6 overlapping radiocarbon dates ca. 3000 BCE (Fig. 7.1;

Rosen 2013). These deposits show evidence of considerable compression, deliberate burning, and chemical transformation (caused especially by urine), suggesting that the original volume of the deposits as it was laid down, one lens on another, might have reached 10 times the current thickness had it not been constantly modified (R. Macphail, pers. comm.). The point is that this dung layer reflects a period of intense sheep/goat stabling during the Late Timnian. This pattern is also evident in other caves for the succeeding Terminal Timnian and the preceding Middle Timnian (Babenki and Khassanov 2007; Babenki et al. 2007; Rosen 2013; Rosen et al. 2005).

Indirect evidence for pastoralism is evident in the enclosures, defining characteristic Timnian architecture. As per the preceding chapter, these have been universally interpreted as pens (e.g., Abu-Azizeh 2013, 2014; Haiman 1992a, b), and occasionally preserved dung has been recovered (e.g., Kozloff 1981). In the absence of clear dung layers, Saidel (2002b) identified spherulites in the sediments of the enclosures at the Late/Terminal Timnian site of Rekhes Nafha in the Negev Highlands; spherulites, crystallized spheres of calcium carbonate with an organic envelope, produced primarily in the intestines of sheep, goats and other ruminants (Canti 1997), are present in dung and thus may provide a signature for pastoralism (Brochier et al. 1992). Goren (1999) has shown that they are also found in a range of other animals, including for example hyrax and pigeons, although sheep produce the greatest quantities. No quantification controls have been established which calibrate for such variables as diet, season, environment, number of animals, etc.

Beyond meat, dairy products were also exploited. Although the churns characteristic of Ghassulian ceramic assemblages are not present in the Early Bronze Age, analysis of caprid long bones from Arad (Smith and Horwitz 1984), the Early Bronze Age town in the northern Negev, indicates intensification of dairying from the Chalcolithic to the Early Bronze Age, reflected in reduced bone density and calcium in the latter period. Although Arad was not Timnian, the connections with the Timnian were well established, and given the likelihood that dairying was practiced in the preceding periods, it is unlikely that it disappeared in the Late Timnian.

Animals were also likely raised for wool and hair by the Late Timnian. Levy and Gilead (2012) note that there is no evidence for wool spinning during Chalcolithic times in the Levant, but certainly by the mid 4th millennium woolen textiles played a great role in Mesopotamian economies (e.g., Algaze 2008:77–87). Indeed, Lees and Bates (1974) and Sumner (1986) have tied textile production to the rise of external pastoral societies (also see Porter 2012).

If domestic herd animals are dominant in the Late Timnian, hunting still played a role as well. Beyond the few bones of wild animals reviewed above, Negev desert kites, reflecting gazelle hunting, have been dated both by

radiocarbon ((Bar-Oz et al. 2011a; Holzer et al. 2010) and by reference to associated microlithic lunates, primarily to the late 4th and early 3rd millennia BCE. In fact, the very presence of arrowheads, absent from northern lithic assemblages for perhaps two millennia by the time microlithic lunates (a kind of transverse point) evolved among Late Timnian groups, is indicative of the continued importance of hunting. The presence of these lunates in the kites confirms their use in hunting, even if they may also have been used as weapons against people. The decline in proportions of arrowheads in the lithic tool assemblages over time suggests a declining importance of hunting (Fig. 6.1); nevertheless, well into the modern era, Near Eastern pastoralists hunted.

Evidence for exploitation of plants is scarce. At Jebel Jill, Pooidaea grasses dominated the phytolith assemblages (A. Rosen 1995a), but no evidence of cereal husks was present. *Juncus* (rushes) and *Cyperus*-like phytoliths were also identified. The phytolith assemblage contrasts greatly with those of agricultural sites, and A. Rosen concludes that there was no agriculture practiced at Jebel Jill. At the Camel Site, grass phytoliths were scarce and woody phytoliths dominated (Rosen 2011a:36, 165).

Indirect evidence offers additional insight. Milling stones have been recovered from virtually all Late Timnian sites (e.g., Abadi-Reiss and Saidel 2014; Abadi and Rosen 2008; Avner 2002:16; Henry 1995:366; Saidel 2002b; Tarawneh and Abudanah 2013), implying plant food preparation, presumably seeds or nuts of some kind. Glossy blades, sickle segments, have been recovered in very low numbers at some Timnian sites. For example, the Camel Site assemblage contained eight glossy blades, comprising only 1.6% of the tool assemblage (Hermon et al. 2011); Nahal Mitnan (Rosen 1997:124) contained two sickle segments, for 2.2%; Har Horsha had no glossy blades (Rosen 1997:121); and none of the central Negev Timnian sites excavated by Haiman (Vardi 2014), Ramat Matred 3, Kadash Barnea 86/3, 95/2, the Ein HaMeara, or the Har Saggi sites, contained any glossy blades. Systematic agriculture was not practiced at any of these sites, in spite of the common presence of milling stones at all of them. Thus, foraging of wild foodstuffs also seems likely. Ethnographically, modern Bedouin exploit a wide range of plants for numerous purposes, including beverages, medicinal purposes, cosmetics, and ritual (e.g., Bailey and Danin 1981), although the role of gathering in subsistence is limited. On the other hand, certainly Negev Epipaleolithic and PPNB bands engaged in gathering wild plants for subsistence (e.g., Goring-Morris 1987: e.g., 439).

In important contrast, the Aqaba sites (Herling 2002a,b; Hikade 2009), as reviewed above, although not Timnian in basic affinities, show fair numbers of glossy blades. Hikade (2009) does not provide precise numbers, but notes that at Tall Hujayrat al-Ghuzlan most of the backed and/or serrated blades were

glossy, suggesting greater than 10% of the tool assemblage comprised sickle segments, probably more than 60 segments. Herling (2002a,b) does not give numbers for either Ghuzlan or Magass, but sickle segments are clearly common. One may conclude that the sickle segments reflect systematic reaping, probably in association with the run-off agriculture indicated earlier. To be clear, fair quantities of barley and wild juniper berries were recovered from Ghuzlan, along with lower quantities of wheat, fig, and other fruits and weeds (Neef 2009). Notably, the wild fruits are clearly indicative of gathering, and by extension, one may assume that gathering was a common activity amongst the Timnian pastoralists as well, living in the same environment.

Relatively high proportions of sickle segments were also identified in the tool assemblages from the late 4th/early 3rd millennia Uvda Valley sites with BU124–12% sickle segments, BU18–5.9%, BU17–6.7%, BU16–6.4%, and BU9–6.4% (Rosen 1997:126). At least three of these sites (124, 17, and 9) show architectural characteristics suggesting affinities to the Aradian complex described above. These sites are located on the east side of the Uvda Valley, adjacent to westward draining wadis, providing microenvironments which were suitable for natural, run-off based agriculture, and indeed recent Bedouin farmed in this region (Avner 1990). In accordance with the sickle segments, Avner (2002:19–20) has also claimed the presence of the threshing floors and threshing sledge teeth near some of these sites, but Gurova's (2013) analysis of some of the claimed threshing teeth refutes this argument.

Although no sickle segments were found in the Aradian South Sinai lithic assemblages, the presence of pithoi and large holemouth jars at Sheikh Mukhsen (Beit-Arieh 2003:35) and other sites throughout the desert region suggests import and storage of bulk goods, perhaps foodstuffs.⁴ Finally, it is to be noted that systematic and intensive agriculture was clearly practiced at Arad, the gateway town to the desert (Amiran et al. 1997), as well as at towns like Numeira (e.g., Coogan 1984) and Bab el-Dhira (e.g., Rast and Schaub 2003), to a degree bordering the Timnian desert territories. Given systematic agriculture in desert microenvironments and on its fringes, donkeys for transport, and the presence of milling stones and storage jars at all sites, a reasonable case can be made for exchange of grain for other goods (to be described below), in addition to the foraging suggested above.

Cult and Mortuary Sites

Cult structures assigned to the Early Bronze Age can be divided into two general groups: those which seem to be directly associated with burial

practices, primarily Nawamis and tumuli, and various kinds of ritual structures including open air shrines, small cairn lines, and standing stones (stelae, *massebot*). Only the Nawamis (Bar-Yosef et al. 1977, 1986) can be dated with any certainty, and both the ritual structures and the tumuli are problematic in terms of dating; if they can be assigned in general to the Timnian culture complex, their attribution to a specific phase may be difficult. The platforms and other ritual structures at Har Karkom (Anati 1986:figs. 164–170; 2013), including a concentration of rock art, have been dated to the Bronze Age Complex (extending from 4300–2000 BCE in Anati’s framework), and some of the structures, both domestic and apparent cultic platforms and cairns, appear to be Early Bronze Age, that is Late Timnian. Focusing on identifying Har (Mount) Karkom with the biblical Mount Sinai, Anati (1986, 2013) sees the area as a major focus for ritual and cult through the millennia, beginning with the Paleolithic, but it is difficult to date precisely the features described. The argument is generally strained due to chronological contradictions, unjustified claims for the uniqueness of the phenomena noted, and rationalizations attaching the archaeology to the biblical text.

Avner (e.g., 1984, 1990, 2002) has summarized much of the data on other desert cult structures, suggesting parallels with Near Eastern pantheons, especially in the “families” of small stelae and *massebot* (standing stones). It is difficult to evaluate these interpretations, and even more difficult to reliably date them.⁵

Mortuary structures may occur in large fields, as solitary structures, or in small groups. Some tumuli are found within habitation sites, others are found in geographic proximity to habitation sites, and still others are removed from these sites (e.g., Abu-Azizeh et al. 2014; Haiman 1992a). Based on geographic proximity, Haiman (1992a) dated the tumulus fields of the Central Negev to the Early Bronze II (Late Timnian). Some of the tumuli found in habitation sites have attached rooms (Saidel and Haiman 2014) and some of them contrast in their lithic configuration with other structures within the site, suggesting special function, perhaps related to the tumulus (Rosen 1997:119–127). However, based on well-dated tumuli, strati-graphic, and social considerations, Saidel (n.d.) has argued that the structures, dating clearly to the Early Bronze Age, significantly post-date the tumuli, which he attributes to the Late Neolithic, that is, Early-Middle Timnian tumuli versus Late Timnian structures. The issue of dating the tumuli is difficult. Radiocarbon assays from tumuli (cairns) in the Al-Thulaythuwat area, in eastern Jordan (Abu-Azizeh et al. 2014), indicate early dates contemporary with the tumulus field at Ramat Saharonim (Porat et al. 2006) and the Eilat area (Avner and Carmi 2001), that is generally the late 6th and early 5th millennia BCE, significantly earlier than the 3rd millennium peak of the Late Timnian/Early Bronze Age II.

Both the tumulus fields and the Nawamis (see below) reflect emphasis on visibility, often located on ridges, hilltops, or plateaus, with silhouette or horizon views possible from several locations (e.g., [Fig. 8.6](#)). The group identity function of such visibility has been noted by a number of researchers (e.g., Abu-Azizeh et al. 2014; Haiman 1992a).

Nawamis ([Fig. 8.6](#); Bar-Yosef et al. 1977, 1986; Palmer 1872: e.g., 210, 257–260) are large cylindrical structures, 3–7 m in external diameter and 2 m high, vaulted with corbel arches, and used as multiple-burial tombs. They are found in large clusters or fields of dozens of structures in southern and central Sinai. Regional clusters may reflect discrete social groups. In contrast to the tumuli, artifacts found inside the tombs indicate a mid 4th millennium BCE date, although radiocarbon dates from habitation sites associated with them (Bar-Yosef et al. 1986) indicate that use, at least of the structures, extended into the 3rd millennium BCE. Of course, dating of the Nawamis by association with the habitation sites is problematic, as per the tumuli in the Central Negev.

Bar-Yosef et al. (1983; also Hershkovitz et al. 1985) have noted the setting sun orientations of Nawamis entrances, and have suggested symbolic ties between the Nawamis and Egypt, based on the importance of the setting sun in Egyptian cult. The presence of Egyptian material culture in small quantities in some of the Nawamis tombs strengthens that association (Bar-Yosef et al. 1977, 1986). Other material culture, beads, tabular scrapers, transverse points, etc., would seem to reflect offerings of one kind or another. At Ein Hudera (Bar-Yosef et al. 1977), nawamis contained up to five individuals, apparently initially primary interments, but later moved aside to allow later interments. The multiple interments suggest family tombs. The presence of many grave goods, primarily personal ornaments and property, contrasts with the burials in tumuli from the Negev (Rosen et al. 2007), although more finds were present in tumuli in the Eilat region (Avner 2002: Figs. 10.24–10.30); there are no obvious indications of status differences in the burial goods.

Rowan et al. (2015; also Rollefson et al. 2013) have described phenomena conceptually similar to the Nawamis in eastern Jordan at the Wisad Pools and Mait-land's Mesa. No detailed reports are yet available, but the long-term use of these mortuary fields is evident. Tower tombs and similar structures (Abu-Azizeh et al. 2014; Giraud and Cleuziou 2009; Steimer-Herbet et al. 2006) in fact seem to be a general feature of the Arabian desert; they seem to reflect something similar to the Nawamis, and perhaps are similar in date. If so, then we can trace a chronological sequence in mortuary behavior from tumuli/cairns in the Early Timnian to vaulted structures in the Middle-Late Timnian.

A key point to be emphasized, one true for the earlier phases of the Timnian as well, is that these ritual behaviors are unique to the peripheral zones. Mortuary behavior in the settled zones contrasts considerably, consisting

primarily of burials and tombs, not cairn fields, tower tombs, or nawamis, even at desert periphery sites like Arad and Bab-edh Dhra. The very conception of sedentary mortuary systems seems to differ from that of the desert. The megalithic dolmens of the Golan Heights (e.g., Freikman 2012; Zohar 1992) and western Syria (e.g., Bradbury and Philip 2011), and in some places penetrating into the Mediterranean zone, also apparently burial structures, seem to overlap chronologically with the cairns and Nawamis, but have also been controversial in terms of dating. They indeed seem to reflect a phenomenon conceptually similar to the tumuli and related structures in the desert, in the presence of fields, clusters, and visibility from a distance. They too have generally been interpreted as the burial grounds of mobile peoples; they derive, however, from a different culture.

Mobility and Seasonality

As during the earlier phases of the Timnian Culture Complex, the predominance of pastoralism in the desert environment more or less would have demanded some kind of seasonal movement. For the earlier phases, scholars such as Henry (1992) and Kozloff (1981) fitted their reconstructions of seasonal movement to the geographic variability of the regions under study, the Jordanian Plateau/Rift valley and Sinai, respectively, based primarily on subsistence requirements, especially the demands of the herds, water and pasture, and the seasonal availability of different resources in different environments of the yearly round. In this, the reconstructions are similar conceptually to those of the preceding periods, especially the PPNB (e.g., Bar-Yosef 1984; Simmons 1981), or the Epipaleolithic (Goring-Morris 1987:fig. XI-1), based essentially on environmental and seasonal variability, most notably from higher and cooler areas in the summer, and winter dispersal and movement to lower areas. Reiterating earlier discussion for the sake of comparison, Henry (1992) based his reconstructions on site size and lithic assemblage configurations,⁶ whereas Kozloff (1981) relied especially on ethnographic analogy with modern Bedouin society in Sinai, suggesting summer aggregation around permanent water sources. With the exception of Kozloff (1981), these reconstructions are all based on what Johnson defined as vertical nomadism, the exploitation of the ecological differences resulting from differences in altitude. Cohen and Dever (1978; but see Dever's major qualifications, Dever 1992) are explicit in reconstructing a north-south movement, between the Hebron Hills and the Central Negev in the Early Bronze Age IV (Terminal Timnian). Although there is little difference in

altitude, the reconstruction suggests exploitation of seasonally varying resources across ecological zones. Given the different geographies, the reconstructions do not necessarily contradict one another; the key point is that they are all geographically deterministic.

However, by the Late Timnian phase, external relations would have played a considerably greater role in determining the nature of seasonal movement. The specific nature of those relations will be reviewed below, but their impact on mobility is considered here. Thus, on one hand, patterns of aggregation and dispersion, based on water and pasture needs as suggested for preceding periods, must have continued. The large Early Bronze Age sites of the western central Negev (Cohen 1999:71; Haiman 1992b; Saidel and Haiman 2014) with sets of individual compounds and large fields of tumuli (as above, perhaps not related) contrast with smaller and more dispersed campsites in other areas of the central Negev (Haiman 1992b). These size contrasts, along with apparent functional differences, suggest both seasonal variation in activities as well as in group structure (also Abu-Azizeh 2013, 2014). Bar-Yosef et al.'s (1983; also Hershkovitz et al. 1985) reconstruction of nawamis seasonality, based on doorway orientation, also implies seasonal movement combined with aggregation and dispersion. However, none of these models of seasonal movement incorporate migration beyond the nomadic territories themselves, that is, beyond the desert.

Abe (2008), Abu-Azizeh (2013), and Müller-Neuhof (2013, 2014) explicitly link their models of seasonal movement to a trade system based on the production and export of tabular scrapers from the quarry sites in the east to the settled zones, from the desert to the Mediterranean zone, combining both needs for pasture with the demands of a nascent market system. Although Abe (2008) and Müller-Neuhof (2013) attach the trade to pastoralists, they both imply an industrial scale to the trade system, based on the large extent of the tabular scraper quarry sites (cf. Quintero et al. 2002).

Beyond the tabular scrapers, clear evidence of the movement of bulk goods, copper and milling stones, both in and out of the desert zone (e.g., Abadi and Rosen 2008; Ilan and Sebbane 1989), along with the preciousities (Rosen 2003b) previously recognized for earlier periods, demands consideration within the general system of seasonal mobility. Numerous scholars (e.g., Amiran et al. 1997; Finkelstein 1990; Kempinski 1989) have viewed Arad as a veritable gateway to the desert, a frontier market which perhaps functioned for Early Bronze Age nomads much as Gaza did for the 19th and early 20th century Bedouin (e.g., Israel 2006). Other sites, perhaps Bab edh Dhra, for example (Rast and Schaub 2003), may also have served this function. These markets must have been part of the seasonal round for at least some of the nomad population.⁷

The precise configuration of the seasonal round is difficult to reconstruct. If on one hand, the best grazing in the deserts matures in the spring, in the Negev especially in the higher regions, commodities like copper and milling stones are not restricted to a particular season for use or exploitation; the animals may also have been traded, as suggested by LaBianca (1990), at Iron Age Hesban in Jordan. If so, then the date of arrival at a gateway city may have been dictated by market demands for meat and considerations concerning labor input and growth patterns, as in recent Lur nomad systems (Black-Michaud 1986). Regardless, the new configuration of relations with the settled zone would have both added a major stop on the seasonal round and affected the scheduling.

Material Culture

The material culture assemblages of Late Timnian groups reflect technological, functional, and stylistic continuities with earlier phases of the culture, as well as contrasts with Early Bronze Age material culture in the sedentary zone. On the other hand, the intensification of trade relations with emerging complex societies adds new dimensions to the material culture systems of production, distribution, and consumption. As with other components of society, there is also a chronological aspect.

Chipped Stone Industries

As in preceding periods, lithic assemblages dominate quantitatively. Technologically two basic industries can be defined: a small flake industry (Fig. 9.3), supplying well over 90% of the tools found in any habitation site, and the tabular scraper industry described in the previous chapter. (e.g., Henry 1995:364–365; Hermon et al. 2011; Kozloff 1973; Rosen 1997:100–111). As with the earlier phases of the

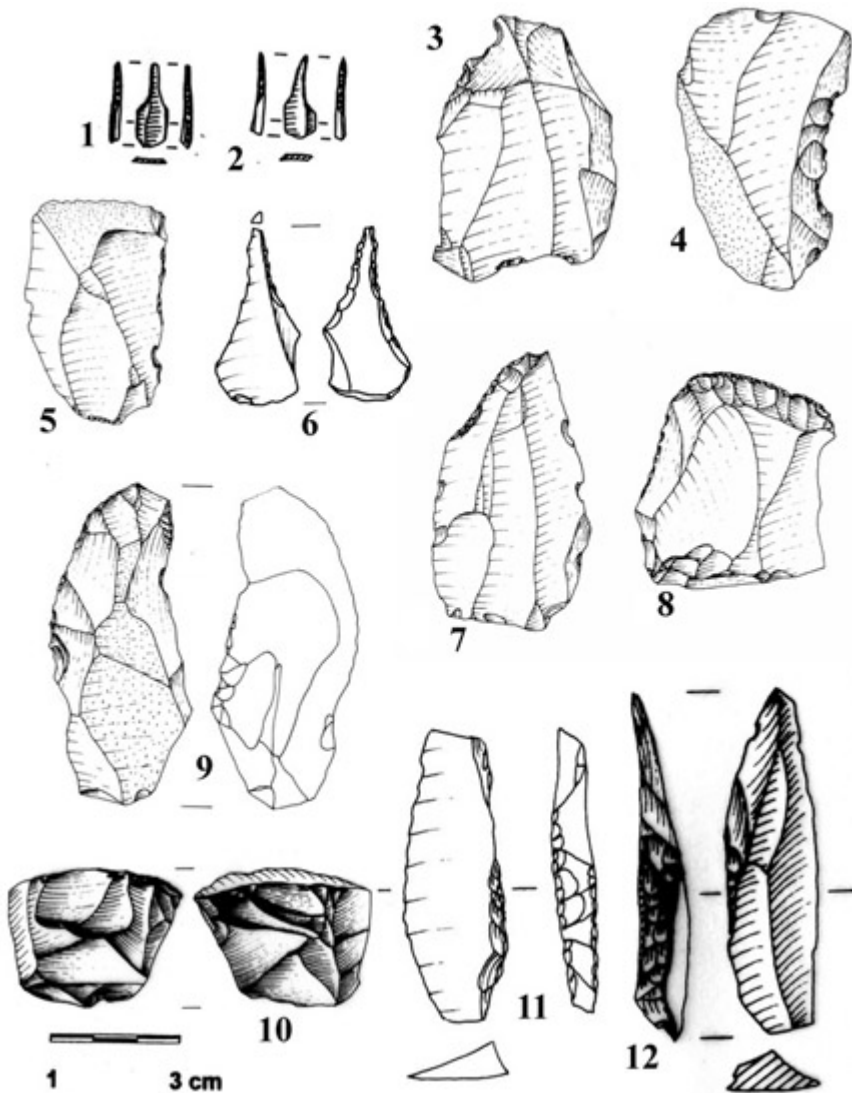


Figure 9.3 The Timnian small flake industry (from the Late Timnian Camel Site [Hermon et al. 2011]). 1–2. Microlithic drills, 3. Notched piece, 4. Denticulated piece, 5. Retouched flake, 6. Awl, 7–8. Scrapers, 9. Retouched flake, 10. Flake core, 11–12. Backed blades. For other characteristic lithic types, arrowhead types are illustrated in [Figure 6.5](#), knives in [Figure 7.4](#), and tabular scrapers in [Figures 8.9 and 8.10](#).

Timnian, the small flake industry provided a range of blanks. Variants of a simple *chaîne opératoire* based on direct percussion hard hammer reduction of small cores produced a range of blanks including small flakes, small blades, and bladelets. No dedicated blade or bladelet cores are evident (although mixed flake/blade/bladelet cores are present in small numbers), and differences in blank morphology resulted from differences in reduction stage, and minor

variations in core orientation. No systematic evidence for core preparation or rejuvenation is present. Raw materials are local. This technology produced the entire range of tools produced on site.

The tabular scraper industry (Figs. 8.7, 8.8), as described earlier, contrasts totally in technology. The large cortical flakes would have required significantly greater force than needed for the small flake industry. The large bulbs of percussion on all pieces and facets on some of them indicate large and heavy hard hammers, or perhaps even block-on-block reduction. As for the earlier phases of the Timnian, habitation sites do not contain debitage which might reflect on-site production, and tabular scrapers were evidently manufactured at the quarry sites. Unfortunately, in the meantime no dates are available from any of these sites, although there is consensus on a general 6th–3rd millennium attribution.

Typologically, the small blank component of Late Timnian lithic assemblages is comprised of a range of ad hoc elements (informal scrapers, notched pieces, denticulated flakes, retouched flakes and blades, various kinds of pointed pieces, awls, etc.) and more standardized elements including transverse arrowheads, microlithic drills, arched backed blades, and sickle segments in some sites (Fig. 9.3; e.g., Henry 1995:362–365; Hermon et al. 2011; Kozloff 1973). In the 4th millennium BCE the transverse arrowheads tend to be rectangular in shape, whereas by the 3rd millennium they are lunates (Fig. 6.5; Rosen 1983a; Rosen 1997:39–44). Occasional rare small points (e.g., Hermon et al. 2011:Fig. 6.2.9) also occur. Notably, chipped stone axes have dropped out of the repertoire by the Late Timnian, although polished votive axes of basalt and other stones have been recovered from tumuli and other sites (e.g., Bar-Yosef et al. 1986; Saidel and Haiman 2014:21). Tabular scrapers are not uncommon; they come in a variety of shapes and most are fragments. Patterned cortical incisions (as opposed to macroscopic striations) are not uncommon in Early Bronze Age sites in the settled zone (Rosen 1997:figs. 3.33, 34), although they are rarer in the desert sites (e.g., Gersht 2003; Vardi 2014: fig. 3.3.2).

Functionally the tool assemblages from Late Timnian sites reflect a range of domestic tasks. Of particular note are the microlithic drills, used for bead manufacture, the arrowheads, presumably for hunting and perhaps for warfare, and the tabular scrapers, perhaps used in domestic cult given their import to the sites and the occasional symbol incised on the cortex, but probably also augmenting the ad hoc industry (for detailed review from the Camel Site, Hermon et al. 2011; Rosen 2003b). The relative proportions of glossy blades accords well with geographies of potential agriculture (Fig. 6.2); the central Negev sites (Hermon et al. 2011; Rosen 1997: fig. 5.10; Vardi 2014) and South Sinai (Bar-Yosef et al. 1986) have few or no sickle segments whereas contemporary sites in the Uvda Valley (Rosen 1997: fig. 5.9) show fair numbers,

indicating that farming was practiced. Of course, contemporary sites in the Mediterranean zone had numerous sickle segments in their lithic assemblages (e.g., Rosen 1997: figs. 5.11, 12).

Finally, the structure of lithic production shows no evidence for specialization. If tabular scrapers are imported to the sites, there is no reason to assume that they were not produced as a part of a seasonal round, or perhaps in some informal exchange system between neighboring groups who had access to the quarry sites. Some of the tools seem to have been used in quasi-specialized cottage industries, e.g., bead making and export, and microlithic drills were probably manufactured by the bead makers, as at the Camel site where evidence for drill manufacture and bead manufacture was found in the same locus. Nevertheless, with the exception of tabular scrapers, there is no evidence for overproduction of any chipped stone tools.

The contrasts with the northern farming zone industries are important. Early Bronze Age industries in the Mediterranean zone are characterized by ad hoc flake technologies and tools, like those of the desert. However, the specialized manufacture and distribution of Canaanite blades⁸ for sickles by a restricted number of well-skilled knappers (Manclossi et al. 2016; Rosen 1997:44–60) constitutes both a typological contrast with the sickle segments used in the desert, and more importantly, a major contrast in the structure of production. That is, the Canaanite blade distribution system did not extend into the desert, not even into those areas where agriculture was practiced, such as the Aqaba area or the Uvda Valley, underlining the contrasts between desert systems and those of the sedentary zone.

The seemingly large-scale import of tabular scrapers into the Mediterranean zone from the periphery (Abe 2008; Müller-Neuhof 2013, 2014; Quintero et al. 2002) reflects the difference between consumer, in the sedentary zone, and producer/supplier in the desert. Virtually all Early Bronze Age urban sites⁹ (contemporary with the Late Timnian) contained numerous tabular scrapers, often incised (e.g., Arad [Schick 1978]; Megiddo [Shimelmitz and Adams 2014], Bab edh Dhra [McConaughy 1980], and Yarmuth [Rosen 1988b]). The site of Mitzpe Shalem (Greenhut 1989), in the Judean desert overlooking the Dead Sea, interpreted as a cult center of some kind (Bar-Adon 1989), contained some 400 tabular scrapers, many broken, and should also be attached to the northern culture. Interestingly, assemblages from sites like Ghuzlan and Magass (Herling 2002a,b; Hikade 2009), and the Aradian sites of south Sinai (Gersht 2003), also contain higher proportions of tabular scrapers than those of Timnian sites. In addition to the distance factor, there are clearly issues of special demand at play.

Finally, the presence of arrowheads in the desert also contrasts with the Mediterranean zone. Although chipped stone arrowheads of various kinds are

found in Mesopotamia and Egypt in the 3rd millennium BCE, they are not part of the southern Levantine lithic repertoire (Rosen 2013), even more emphasizing the contrasts, both functional and stylistic between the Levantine settled zone and its desert hinterland.

Ground Stone Industry

As in preceding periods, grinding stones continue to play an important role in desert material culture. Primary types are large lower grinding slabs and smaller upper rubbers. Stone vessels have not been discovered in desert sites. Raw material varies with area. In the Negev Highlands, three materials are present: ferruginous sandstone, quartzitic sandstone (that is, metamorphized sandstone), and rare pieces of basalt (Abadi and Rosen 2008; Abadi-Reiss and Saidel 2014; Rosen and Schneider 2001). In Sinai, grinding stones and slabs were made of sandstone, granite, and limestone, and stone lids and whetstones of sandstone were also found (Bar-Yosef et al. 1986). At Jebel Jill, in Jordan, grind slabs were made of limestone (Henry and Turnbull 1985). In northeastern Jordan, basalt is a common material for milling stones (Helms 1991). Wright (1993, 1994) notes that for earlier periods, the desert zones were the only regions in which sites occasionally did not have milling stones; by the Late Timnian, this is not the case, and all sites contained grinding stones of one kind or another. It is hard to quantify this since milling stones are often not collected, or not collected systematically (cf. Abadi and Saidel 2014; in general, see papers in Rowan and Ebeling 2008).

Regardless, unlike the preceding periods, there is clear evidence of manufacture *and* export of grinding stones from the Negev Highlands to the north (Abadi and Rosen 2008; Abadi-Reiss and Saidel 2014; Rosen and Schneider 2001), at least to Arad¹⁰ (Amiran et al. 1978:57–58), and probably other sites as well. The two types of raw material exploited, the metamorphic quartzitic sandstone and the ferruginous sandstones mentioned above, both derive from Jurassic exposures in the *Makhtesh* Ramon (Rosen and Schneider 2001). Production waste from the reduction of sandstone blocks has now been reported from many sites (Abadi and Rosen 2008; Abadi and Saidel 2014; Saidel 2002b), and even when collection has been inadequate, the mere presence of chips and flakes of sandstone on sites well removed from the sources indicates either on-site manufacture of milling stones, or their repair. The evidence from the Camel Site, including rough-outs and sandstone blocks (Abadi and Rosen 2008; Rosen and Schneider 2001), as well as sandstone microartifacts indicating grinding (or perhaps use) (Ryan et al. 2011), makes it clear that milling stones

were produced on these sites. The total absence of production waste from Arad (as well as other sites) makes it clear that the sandstone grinding stones were imported to the site, probably in the thousands, over the course of its several hundred years of existence as a town. Thus, the milling stone system consisted of quarry sites exploited opportunistically by desert peoples who removed blocks to their basecamps, finished the rough-outs, and then exported them to consumer sites like Arad (Abadi and Rosen 2008; Rosen and Schneider 2001). In light of the fact that one apparently unused milling stone from the Camel Site weighed 28 kilograms, the use of donkeys, domesticated perhaps half a millennium earlier, is clearly indicated. The implications of donkey domestication for trade in bulk goods are obvious (e.g., Ovadia 1992).

Shells, Beads, and Other Trinkets

The assemblage of trinkets, sea shells, stone beads, and other preciosities documented for the Early-Middle Timnian exhibits general continuity through the Late Timnian. Bar-Yosef Mayer (2007) notes the continuity in the shell assemblages, but also notes the addition of “Conus Apex Beads” deriving from the Red Sea, specifically in Early Bronze Age II assemblages from Bab edh Dhra and Jericho, in Early Bronze II Arad associated sites in South Sinai, and in some of the nawamis. If the nawamis represent indigenous culture, and the new bead type is found most notably in northern towns and Aradian outposts, then the addition of the new type into indigenous practice may be a function of these new connections.

The sources of the shells correspond at least partially to geographic locale. All of the shells from sites in Sinai, even those from Arad-associated sites, originate in the Red Sea (Bar-Yosef Mayer 1999:151–158), as do those from Jebel Jill, in Jordan (Henry 1995:368). In the Central Negev, shells derive from the Red Sea, the Mediterranean, and freshwater sources, perhaps the Nile (e.g., Mische-Brandl and Saidel 2014; Rosen et al. 2011). As in the earlier periods, shells from sites on the edge of the settled zone, for example at Arad (Amiran et al. 1978:9, 54–55, Pls. 67:1–2, 68:1–21, 69:1–21) and other sites (e.g., Wadi Fidan 4 [Muniz 2007:169]), derive from all areas.

Beyond the seashells, other beads and ornaments were made of copper (e.g., Avner 2002:55; Bar-Yosef et al. 1986), ostrich eggshell (e.g., Rosen et al. 2011), gold (Mische-Brandl and Saidel 2014;), ivory, carnelian (Bar-Yosef et al. 1986), bone (Mische-Brandl and Saidel 2014;), and various kinds of stone, such as quartz crystals or obsidian (e.g., Rosen et al. 2005). The appearance of metal ornaments and beads, gold and copper, reflects a greater range and intensity of

external relations, as well as new technologies. Thus, obviously, the presence of copper wire and ornaments (Avner 2002:55; Bar-Yosef et al. 1986), and other copper items (Segal and Rosen 2011), reflects the penetration of copper into the desert; the near absence of copper objects in Middle Timnian (Chalcolithic) sites, in spite of the likely role that Timnians played in the copper trade, suggests perhaps an early export focus for copper. The gold beads found at Site 25/Ein HaMeara 2 (Mische-Brandl and Saidel 2014;) indicate connections with Egypt.

Trinkets without holes, and therefore not beads, include small fossils deliberately collected, obsidian, quartz crystals, and small pebbles (Rosen et al. 2011). Of particular interest are the three chips of obsidian found at the Camel Site (Rosen et al. 2005), clearly present as semi-precious trinkets, and deriving from eastern Turkey. Although obsidian was traded into the Negev as early as the PPNB (Burian and Friedman 1988), it was utilized as a raw material for tool production, as evident in the presence of cores and waste as well as a range of standard chipped stone tools; these were probably special tools, but tools nevertheless. The obsidian chips from the Camel site reflect non-utilitarian value.

As in preceding periods, beads were manufactured in the desert and traded into the settled zone. This is reflected in the desert sources for many of the bead raw materials, in the discovery of bead production loci, and in the presence of bead manufacturing tools—drills and perhaps copper awls (sometimes referred to as pins)—in many sites. Thus, manufacture of beads from the shells, and from other materials (green stone, ostrich eggshell) took place on-site, in small production loci. Concentrations of microlithic drill bits, probably originally attached to bow drills (Burian and Friedman 1985) have been found at several sites (Burian and Friedman 1987 for the Chalcolithic/Middle Timnian; Hermon et al. 2011; Saidel 2002b for the Late Timnian), as have raw materials (e.g., ostrich egg shell fragments, unworked sea shells, various minerals and crystals) and partially complete beads. The complete range of debris from drill bit manufacture is also present on some of these sites (Rosen et al. 2011), indicating on-site manufacture of the drills as well, and reflecting a vertically integrated production system. Bar-Yosef Mayer (1999:127–128) suggests the probable use of copper tools for some of the sea shell beads in the South Sinai Middle-Late Timnian. The relatively small scale of production can also be seen in the spatial distribution of the drills, concentrated in single loci at both the Camel site (Haimi and Rosen 2011) and Rekhes Nafha (Saidel 2002b), each concentration probably representing the work of a single craftsperson. Other sites such as those reported on by Saidel and Haiman (2014; also Vardi 2014) contained little evidence for drills, so that the activity was relatively restricted. That is, production was neither intensive

nor large scale. Even the Chalcolithic/Middle Timnian site of Nahal Nizzana 103 (Burian and Friedman 1987), with its 6,000 drill bits, is probably best interpreted as a drop site, the entire set of drill bits the size of a small bag in terms of volume. On the other hand, if “cottage industry” seems a good characterization of the craft as practiced in desert Early Bronze Age society, the presence of beads at Arad, with no evidence for manufacture there, and made of raw materials deriving from the desert (Amiran et al. 1978:55), indicates that this cottage industry was nonetheless at least partially aimed at export and trade. Even if most consumption was domestic, as is undoubtedly reflected by the large number of shells and beads recovered from the nawamis, exchange with sedentary society played a role as well.

Copper and Its Alloys

The place of copper and copper production amongst the desert societies has been debated. Copper metallurgy in the Southern Levant begins in the Chalcolithic period, in the late 5th millennium BCE. It seems to appear suddenly, almost full-blown, with remarkably sophisticated technologies and virtually no clear predecessors, in the Ghassulian culture of the northern Negev and areas farther north (e.g., Golden 2010), the settled zone by any definition. On the other hand, all the pure copper sources, whether in the Feinan area, Timna and other areas of the southern Rift Valley, or South Sinai, are in the general “nomad zone”, although Feinan abuts the Mediterranean zone of the Jordanian Plateau. The copper alloy sources may have derived from as far afield as Turkey (e.g., Hauptmann and Weisgerber 1992:63), although there have been claims for local sources (Avner 2002:51–53) and intentional alloying (Lechtman and Klein 1999).

Ghassulian copper metallurgy is remarkably sophisticated, comprised of several variants of copper and its alloys, including pure copper, and alloys including varying amounts of arsenic and antimony (e.g., Tadmor et al. 1995). Both simple open mold and complex lost wax casting techniques were commonly practiced, and objects included a range of what appear to be utilitarian goods (awls and perhaps axes) and many cult objects. The cores and fillers present in the lost wax objects have been demonstrated to be local (e.g. Shalev et al. 1992), indicating local manufacture, in the general region. The symbolism behind both the objects themselves as well as their manufacture was rich (Gošić 2008), and also local.

The total absence of evidence for Ghassulian cultural presence at any of the copper bearing sites, in spite of intensive surveys by numerous teams, rules out

the likelihood of systematic Ghassulian mining; it suggests that indigenous people, that is, the Timnians, engaged in the earliest ore trade and perhaps aspects of production (e.g., Anfinset 2010; Gates 1992; Rothenberg and Glass 1992). Rothenberg (1972:27–55) has identified a Chalcolithic smelter at Timna, explicitly linking it to local peoples. The Timnian basecamp of Nahal Tsafit (Rosen 2013) lies directly on the route from Feinan to Beersheva, and the Beersheva Chalcolithic sites; it probably reflects the Timnian copper trade. Pottery from the site with basalt temper probably indicates a Feinan source.

In spite of this, Middle Timnian sites show a dearth of copper objects. Neither Kvish Harif (Rosen 1984) nor Nahal Tsafit contained any copper objects. By the 4th millennium, the Nawamis contain small copper items, awls and wire (Bar-Yosef et al. 1977, 1986). The Aqaba sites also contain copper objects, and most notably evidence for copper working. But, then, the nawamis are tombs and thus constitute special contexts, and the Aqaba sites do not appear to be strictly speaking Timnian in cultural affiliation. It is not clear how common copper really was among the Timnians in the 5th and 4th millennia BCE.

By the early 3rd millennium, the seven copper objects¹¹ (Segal and Rosen 2011) recovered from the Camel Site, a small Late Timnian encampment in Mitzpe Ramon, in the Central Negev, suggest a significant change in the copper system. The assemblage consists of two awls, two prills, and three lumps of copper, perhaps reworked from other objects. The assemblage includes objects of both arsenical copper (one of the awls) and pure copper. It most likely derives from Feinan, although Timna cannot be ruled out. It seems to reflect both the use of copper, in the awls, and the scavenging of copper for trade (otherwise, it is hard to explain the presence of prills in a site without any evidence for smelting). This picture links up well to the clear evidence for increasing intensity of mining at Feinan (Hauptman 2000; Levy et al. 2002; Adams 2002) and to evidence at Arad (Early Bronze Age II strata III and II) for a major increase in copper consumption; Ilan and Sebbane (1989) enumerate 57 copper axes/chisels and adzes and 155 awls recovered from excavations at the town, basically an axe and multiple awls for every house excavated. They also document reworking/recycling of copper at the site. This, of course, links up to the clear evidence for copper production and trade linked to Arad found in the South Sinai sites (Amiran et al. 1973; Beit-Arieh 2003:196–208), especially based on petrographic analyses of ceramics (e.g., Porat 1989). Kempinski (1989) sees this metal trade as Arad's primary *raison d'être*.

The contrast with the preceding periods needs to be emphasized. If in the Chalcolithic, copper production is dominated by cult items and the lost wax method, by the 3rd millennium BCE lost wax casting is absent and copper objects are overwhelmingly utilitarian, most notably copper axes and awls.

Copper production in Feinan by this period can probably be characterized as industrial (Adams 2002; Levy et al. 2002), of course more possible with simple casting methods. De Miroschedji (1986) has suggested that the Aradian sites in South Sinai functioned as trading outposts, complete with ores, crucibles, and molds, and reflecting the increased demand for copper. Although Beit-Arieh (2003:201–204) has claimed that most of the metal working at these sites was conducted by Aradian “colonists” exporting their products back to the town, Avner (2002:45) claims that the sites are indigenous villages and has noted the distance from the South Sinai sites to the actual copper sources; he ignores the contrasts evident between Aradian and Timnian architecture, material culture, etc. In this case, the indigenous Timnians (cf. Rothenberg and Glass 1992) were probably miners, opportunistic producers, and perhaps copper scavengers, as at the Camel Site. Unlike the Camel Site, there was clear production of copper objects on the sites themselves, by people with material culture best attributed to Canaan, in the north.

Ceramic Assemblages

Late Timnian ceramic assemblages are comprised typologically of the following types: holemouth vessels (jars and cooking pots), bowls and cup-bowls, globular jars, jugs and juglets. The assemblages are dominated numerically by holemouth vessels, such that, for example, they comprised over 90% of the diagnostic sherds recovered from the Central Negev sites excavated by Haiman (Saidel and Haiman 2014) and 60% at the Camel Site (Saidel 2011). Other sites show very few sherds, but holemouth vessels still constitute the majority (e.g., Bar-Yosef et al. 1986; Saidel 2002). In addition to the morphological types, ledge handles, rope decorations, and red painted sherds have been found, but are not common. Saidel’s (2002a) comparison of the typological configuration of Timnian sites to those of both Arad and Aradian sites demonstrates significantly lesser typological diversity in Timnian sites. The Timnian sites also show significantly lower absolute quantities of pottery. The differences in ceramic assemblage structures suggests a contrast in basic lifeways, sedentism versus mobility (cf. Juli 1979), and basic differences in site function and cultural affinities (cf. Beit-Arieh 1986).

Petrographic analyses of ceramics from Timnian sites in the Central Negev (Cohen-Weinberger and Saidel 2014; Saidel 2011) show that pots originate from all parts of the Negev, South Sinai, and/or southern Jordan. Pottery in the Aradian South Sinai sites also originates from a number of sources, most notably from the general area of the town of Arad. In the original ceramic

petrographic analyses demonstrating connections between South Sinai and Arad, Amiran et al. (1973) concluded that the Aradian (Canaanite) settlements in the region related to an intensive trade system between Early Bronze Age Canaan and South Sinai (also Beit-Arieh 1986). Furthermore, pottery found in Arad has sources from South Sinai, the rest of the Negev, and/or southern Jordan (Amiran et al. 1973; Glass 1978; Porat 1989; Rothenberg and Glass 1992). The primary focus of this system was the exploitation of copper. As in the Central Negev sites, research by the Ophir expedition (Beit-Arieh 1986, 2003; Porat 2003) also demonstrated that the South Sinai indigenous sites, Timnian in the terminology adopted here, also contained exogenous pottery from the northern Negev. Beit-Arieh claimed that this pottery derived from the local Aradian (Canaanite) sites, that is, it was traded from the Aradian sites rather than Arad. However, the presence of Aradian pottery at late Timnian sites in the Central Negev, far removed from the Aradian settlements in South Sinai, strongly suggests direct connections to Arad.

Pastoral Nomadism and the Rise of Economic Asymmetry

As detailed above, the Late Timnian phase, ca. 3000 BCE, marks the culmination of trends apparently initiated about a millennium earlier in the intensification of exploitation of the desert beyond subsistence and reciprocal exchange. Compared to earlier phases, the Late Timnian saw a major increase in desert populations, perhaps with an added level of social organization, and increased ties to the sedentary zone with concomitant increased production to fuel those ties. Ultimately as a result of these two complementary trends, Late Timnian society ceased to be economically autonomous and subsistence based; rather, having crossed a demographic threshold, economic integration with sedentary farming societies resulted in the development of asymmetric economic relations, a kind of dependency, the end of the herding-gathering systems, and the rise of pastoral nomadism (see discussion in [Chapter 3](#)).

Demography and Social Organization

The archaeological record shows a major increase in number of sites in this period and hints of an increase in the size of some of the sites or aggregates. Restricting discussion to the Central Negev, for which there are systematically

collected quantitative data and also better chronological control, the number of sites attributed to the Early Bronze Age increased sometimes on the order of tenfold or more over the preceding Chalcolithic period (Fig. 9.4), that is, from Middle to Late Timnian. Although it seems natural to attribute these changes to population increase, in fact the interpretation demands methodological explication.

Three issues need to be addressed:

1. Are there factors, either natural or human induced, which might differentially affect site preservation or site visibility from period to period, thus biasing the site numbers?
2. Are there changes in social or demographic structures (e.g., site size, site population densities) which might result in fewer or greater numbers of sites, without reflecting population size? In other words, are there social factors which might suggest that there is no correlation between numbers of sites and numbers of people?
3. Related to the above question, what role does mobility play in such assessments, and are there differences in mobility from period to period which might negate a correlation between site numbers and population?

With respect to potential biases in site preservation/visibility, three hypothetical factors can be proffered: 1. A change in architecture such that one site type characteristic of one period might preserve or be visible while another, from another period is not; 2. A change in site micro-location from one period to another resulting in differential preservation; and 3. A change in geomorphic regime resulting in differential site preservation and lower site numbers for an earlier period.

None of these are viable explanations for the changes in site numbers seen in Figure 9.4. Timnian architecture, the enclosure-and-attached-room compounds, is remarkably stable over several thousand years, and there is no evidence for chronological variability which might affect demographic assessments. There is no evidence for changes in site micro-location, which might affect site preservation. Beyond the unlikely possibility that in the Early and Middle Timnian, sites were located exclusively in wadi channels subject to greater erosion, it is even difficult to imagine such a scenario. Finally, there are no changes in geomorphic regime which might differentially affect site numbers. The fact is that Timnian sites in the desert, regardless of what phase of the Timnian, have preserved reasonably well and are visible even in surface survey.

With respect to social or demographic structures, compound sizes and

structure are roughly comparable over the millennia, and if anything, site sizes increase in the period when site numbers increase. That is, there is no evidence, for example, of population contraction into a central site or sites, thus resulting in a decrease in site numbers.¹² In general, there is no reason here to negate a correlation between site numbers and population.

The issue of mobility and its effect on site numbers and visibility is more complex. Certainly, the more mobile a group, the more sites they will presumably leave behind. However, assuming that mobility is in general necessitated by seasonal availability of resources, then increased mobility without increased population will

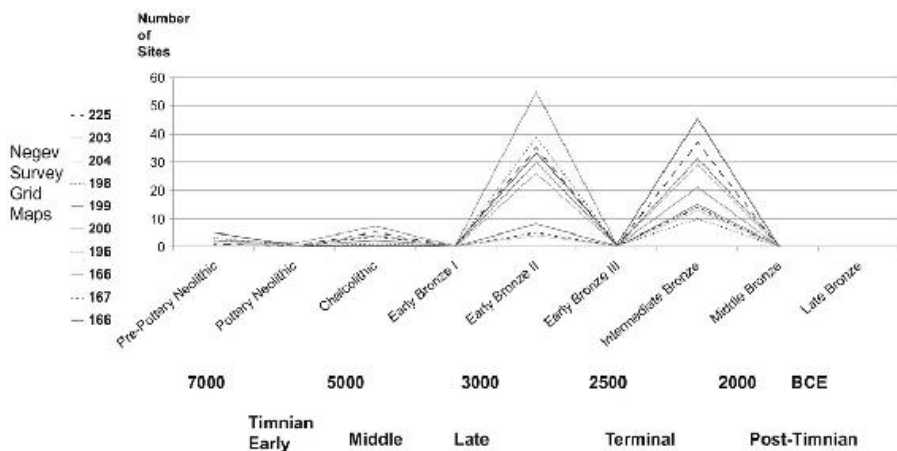


Figure 9.4 Site frequencies from the Pre-Pottery Neolithic through Terminal Timnian and the Middle and Late Bronze Ages, as derived from Archaeological Survey of Israel maps of the Central Negev.

Note: c.f. Rosen 2007, 2009.

result in more sites over a larger expanse (without entering into a discussion of why there might be increased mobility); one would also expect to see sites less intensively occupied, with less accumulation and less investment. Finkelstein and Perevoletsky (1990) have claimed that this greater mobility will decrease site visibility, thus effectively *decreasing* site numbers. The issue is rendered even more complex in the case of a tethered site system, where groups return to the same site over the course of decades (cf. Haiman 1992b; Henry 1992), as is clearly the case for all of the Timnian Complex; if sites in one period are occupied 20 years and in another later period, 40 years, then the number of sites in the former period will be twice that of the latter, all other factors remaining equal.

It is impossible without a large set of standardized excavations offering detailed data on intensity of occupation to assess these possibilities adequately;

however, two considerations mitigate against changes in mobility as an explanation for increase in site numbers. First, all sites show repair and re-use, presumably over relatively extended periods of time. There is no evidence that the few Middle Timnian sites excavated were utilized for significantly longer terms than the Late Timnian sites, and there is no evidence for decreased visibility of sites. Second, given the large order of increase (e.g., Map 204 of the Negev Emergency Survey contained 32 sites dated to the Early Bronze Age, two to the Chalcolithic-Early Bronze Age and a single site to the Chalcolithic proper, Kvish Harif [Rosen 1984]), this would require a tenfold difference in terms of exploitation. That is, if as a rule Late Timnian sites were utilized seasonally for 20 years, Middle Timnian sites would need to be used for 200 years for a claim of population equivalence to be viable. There is no evidence for such long-term systematic exploitation of any site.

The issue of open and closed systems and the territorial expanse of mobile societies might also affect site numbers. If territories are larger in one period and smaller in the next, that is, a *decrease* in amplitude of mobility, it is conceivable that more sites will be present in the smaller territory. However, this actually reflects a real demographic increase in the survey area. Beyond this, the Late Timnian seems to show increase in site numbers throughout the southern Levantine desert expanse, even if the difficulties of dating survey sites render this difficult to really pin down.

In addition to number of sites, there are hints of an increase in site size. In Haiman's (1992b, 2014) typology of Early Bronze Age II (Late Timnian) sites he offers a general size range with a maximum site size on the order of about 1500 square m, seemingly considerably larger than sites excavated from the preceding periods in the general region. Some sites seem to reflect aggregates, that is, sites with multiple compounds¹³ (e.g., Saidel and Haiman 2014:7–58, also e.g., figs. 2.1, 2.12). Unfortunately, chronological attribution of the earlier periods has been difficult.

Given the above, one may conclude that the Late Timnian saw a significant increase in population in the Central Negev. Judging from surveys conducted in South Sinai (Beit-Arieh 2003), the Southern Negev (Avner 1990; Avner and Carmi 2001), and areas of eastern Jordan (e.g., Abu-Azizeh 2013, 2014), similar processes may be evident, although chronological uncertainties leave conclusions open.¹⁴

Given the increased population evident in the Late Timnian, one might assume that a concomitant change in social structure might be readily evident. However, unlike the case for the Early Timnian, when new social structures developed, as reflected in the appearance of large-scale burial grounds and monumental cult sites, no clear evidence for such major changes is evident in the transition to the Late Timnian. Given the demography, expansion into new

geographic zones, and the obvious economic intensification (see below), this apparent anomaly requires discussion.

There are indeed hints of social adjustment. The variability in site sizes, or more importantly, enclosure sizes, suggests variability in herd sizes (Haiman 1992b); this may be a reflection of differential wealth. The discovery of three gold beads at Site 25, En Hameara (Mische-Brandl and Saidel 2014:), would also imply some distinctions in wealth, although whether gold had the same meaning in Late Timnian culture that it has today, or even that it had among contemporary sedentary peoples, is not clear. The general scarcity of items that might reflect status in Timnian habitation sites makes the issue difficult. However, comparison of burial goods offers some further insight.

Beginning with the relative scarcity of burial goods in the Early-Middle Timnian, the three tumuli at Ramat Saharonim contained all of four shell beads and an *Equus* bone. Contemporary tumuli excavated by Avner (2002: Figs. 10.24–10.30) in the Eilat area showed more grave goods than found in Ramat Saharonim, but still not large quantities. In contrast, the 4th millennium *Nawamis* tombs of South and Central Sinai (Bar-Yosef et al. 1977, 1986), post-dating the tumulus systems by roughly a millennium or more, show a wealth of grave goods, most especially those indicating personal identity (beads, trinkets, etc.), and presumably status. Although the materials do not reflect any clear discrepancies in wealth between individuals or families (as presumably reflected in individual *Nawamis* with multiple burials), the contrast with the preceding phases of Timnian culture are marked¹⁵ and must reflect an increased emphasis on issues of identity and display. Similar phenomena seem to be present in Eastern Jordan in such sites as Mait-land's Mesa and the Wisand Pools, although the chronologies have yet to be sorted out (Rollefson et al. 2013; Rowan et al. 2015).

These contrasts should probably not be interpreted as a change in social structure, but they seem indeed to represent shifts in social behavior, a continuation of trends already initiated. In the crystallization of Timnian society in its early phase, the rise of tribal organization implied new political structures which managed territories, new layers of relations between groups, and a higher plane of labor organization. The flexibility of tribal structures, in the Near East and among many pastoral groups expressed in segmented lineage organization, is well known (Chapter 3). It appears that the changes evident in Late Timnian society—demographic, economic, geographic—could be accommodated within previously existing social formats.

Economy

Beyond subsistence, the archaeology of Late Timnian society demonstrates a major intensification of economic activities and external relations. Production in the Early Timnian can be characterized as essentially subsistence based, with reciprocal exchange based on personal identity and relatively opportunistic exploitation of resources; that is, the seasonal round was based on pastoral needs, and resources exploited during that round. In contrast, important parts of production in Late Timnian society were geared toward export. A much greater range of goods, extending well beyond goods reflecting personal identities, and well beyond simple reciprocal relations, is evident. Furthermore, the presence of foreign agents in the midst of Timnian territory adds another layer of economic relations. Finally, although somewhat harder to establish, increased material input as a result of these increased external relations can be posited as well.

In particular, there is a clear increase in copper production in the desert in the Late Timnian phase (Early Bronze Age). This is reflected especially in the intensification of mining in Feinan and increased consumption, for example, at Arad. A comparison of frequency of copper artifacts between the Chalcolithic and Early Bronze Age strata at Arad show major increases in the latter period (Ilan and Sebbane 1989). Furthermore, the Aqaba sites and the Aradian sites in South Sinai all contain evidence for copper working and have been linked by virtually all scholars to the copper trade (e.g., Amiran et al. 1973; Ilan and Sebbane 1989; Kempinski 1989; Klimscha 2011). By extension, other Aradian sites are probably also linked to this system. The indigenous desert society is involved in this system, perhaps as miners, perhaps as traders, perhaps as scavengers (e.g., Avner 2002; de Miroshedji 1986; Segal and Rosen 2011; Stager 1992), and to a degree as consumers. Avner (2002:55–56) notes the distance between the Aradian sites and copper sources in South Sinai, sometimes tens of kilometers, and concludes that mining was probably conducted by local peoples.

Increased numbers of tabular scrapers found in Early Bronze Age sites and their apparent connection to contemporary quarry and workshop sites in Eastern Jordan indicate intensification of the tabular scraper trade in this period as well, chronological ambiguities notwithstanding (Abe 2008; Müller-Neuhof 2013, 2014). In addition to the intensification of production, milling stone production and trade from the Central Negev to Arad (Abadi and Rosen 2008) constitutes a new trade system. In the preceding Chalcolithic period there is no evidence for Central Negev sandstones in the Northern Negev.

Other production systems continue, but small samples, especially from the earlier phases of the Timnian, make it difficult to trace intensification in bead production/exchange and trinket exchange. On the other hand, comparison of three habitation sites from the Central Negev, e.g., the Middle Timnian sites of

Kvish Harif (Rosen 1984) and Nahal Tsafit (Rosen 2013), and the Late Timnian Camel Site (Rosen 2011a), all excavated using the same collection methods (Rosen 2011a:6–10), shows that from Middle to Late Timnian there is increasing diversity in items moving between the desert and the settled zone, longer distances of some of the materials, and changes in the function/role of the goods moving between the zones (Fig. 9.5; Table 9.1). Some of these changes may perhaps be attributed to the domestication of the donkey, allowing movement of more and larger items greater distances,¹⁶ but in reality, the adoption of the donkey is as much a result of intensification as a cause of it.

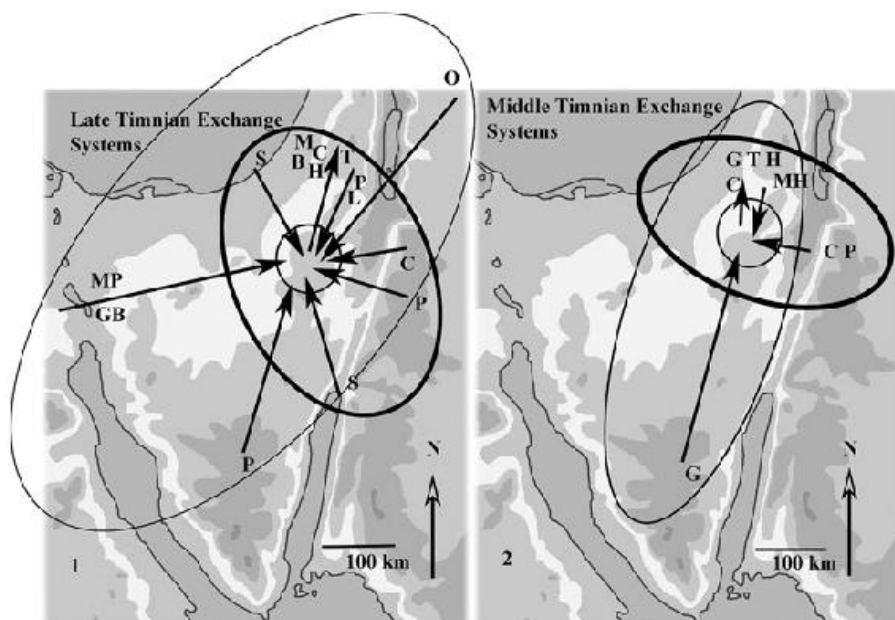


Figure 9.5 Goods moving in and out of Middle and Late Timnian sites. 1. Late Timnian, based on Camel site (Rosen 2011a) and Western Negev Highland sites (Saidel and Haiman 2014), 2. Middle Timnian, based on Kvish Harif (Rosen 1984) and Nahal Tsafit. Smallest ellipse = daily or weekly round, middle ellipse = seasonal round, largest ellipse = long distance exchange. P = pottery, S = sea shells, C = copper and copper objects, O = obsidian (from Anatolia), H = hematite, T = tabular scrapers, M = milling stones, MP = mother-of-pearl, GB = gold beads, B = beads, G = granite and granite objects, MH = mace head.

If the production systems described above reflect intensification, none qualify as intensive production. Late Timnian habitation sites (especially Rosen 2011a; also Saidel and Haiman 2014) show cottage production systems, production for export to be sure, but small scale and in some senses, opportunistic. Production in the Late Timnian still falls well within a domestic mode (cf. Sahlins 1972). Thus, the quarry sites for the production of milling stones (Abadi and Rosen 2008; Rosen and Schneider 2001) show clusters of

Table 9.1 Summary table of imported and exported goods for Central Negev Timnian sites. Notably, some goods are imported as raw materials (e.g., ostrich eggshells) and exported as beads. Late Timnian materials based on the Camel Site (Rosen 2011a) and Western Central Negev Highland sites (Saidel and Haiman 2014). Middle Timnian materials based on excavations at Kvish Harif (Rosen 1984) and Nahal Tsafit (unpublished).

Middle-Timnian	Obsidian	Pottery	Copper Tools	Mineral/Bone Ornaments	Sardell Beads	Crystal Minerals	Tabular Scrapers	Ceramic Artifacts	Copper Ore/Scrap	Mill Stones	Eggshell Beads	Hornbe
Import/Export	Import	Import	Import	Im/Ex	Im/Ex	Im/Ex	Im/Ex	X	Export	Export	Export	Export
Production	Off	Off	Off	Off	Off	Collected	Off	X	Off	X	On	On
On/Off site	Claim											
Operative	Simple	Complex	Complex	Complex	Simple	Simple	Medium	X	Complex	Medium	Medium	Simple
Completion												
State	Finished	Finished	Finished	Finished	Finished	Finished	Finished	X	Raw	Finished	Finished	Semi-Finished
Trade												
Distance	Very Long	Medium/Long	Long	Medium/Long	Long	Short/Medium	Medium	X	Long	Medium	Medium	Long
Quantity	Low	Medium	Low	Low	Low	Low	Low	X	Low	Low	Medium	Low
Mass	Low	High	Low	Low	Low	Low	Medium	X	Low	High	Low	Low
Function	Identity	Utilitarian	Util.	Identity	Identity	Identity	Utilitarian/Symbolic	X	Util.	Util.	Identity	Symbolic
Import/Export	X	Import	X	Im/Ex	Im/Ex	X	Im/Ex	Im/Ex	Export	X	Export	Export
Production												
On/Off site	X	Off	X	Off	Off	X	Off	Off	Off	X	On	On
On/Off site	Claim											
Operative	X	Complex	X	Complex	Simple	X	Medium	Complex	Complex	X	Medium	Simple
Completion												
State	X	Finished	X	Finished	Finished	X	Finished	Raw	Raw	X	Finished	Semi-Finished
Trade	X											
Distance	X	Long	X	Medium/Long	Long	X	Medium	Long/Medium	Long	X	Medium	Long
Quantity	X	Low	X	Low	Low	X	Low	X	Low	X	Medium	Low
Mass	X	High	X	Low	Low	X	Medium	Low	Low	X	Low	Low
Function	X	Utilitarian	X	Identity	Identity	X	Utilitarian/	Symbolic	Symbolic	X	Identity	Symbolic
Symbolic												

(e.g., Fig. 9.6); even the very large tabular scraper quarries found in Eastern Jordan (e.g., Quintero et al. 2002) are best interpreted as pastoral exploitation over the course of centuries, probably seasonal and part of the yearly round (e.g., Müller-Neuhof 2013, 2014), not intensive and directed manufacture (*per contra* Abe 2008), in spite of the large numbers. Furthermore, bead production, the shell trade, and other trinket exchange or raw material exchange systems, can also be characterized as extensive rather than intensive. Although one can isolate crafts and special activities in Late Timnian society, there is no craft specialization; production is based on adjunct skills, and with respect to the goods reviewed above production is a secondary activity, not a primary one.

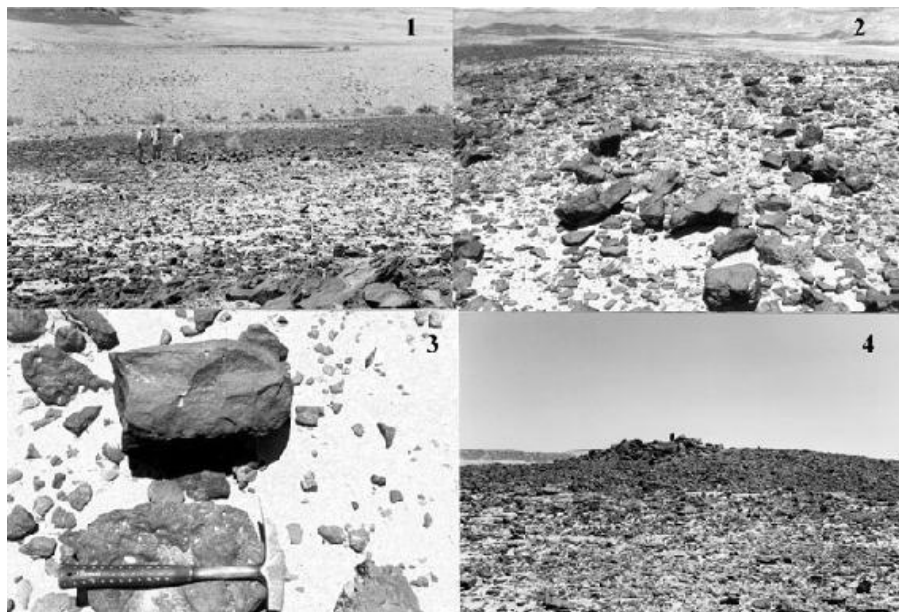


Figure 9.6 Nahal Ramon 160 sandstone milling stone quarry site in the Makhtesh Ramon (Rosen and Schneider 2001). 1. General view of sandstone scatter (the dark stones) looking southwest, 2. Clusters of blocks of sandstone removed from sandstone strata, transported 20–50 m, view facing west, 3. Flaked sandstone block, 4. View of actual sandstone outcrop, facing north.

With respect to the metals trade, if in its early stages the copper system could be characterized as extensive, with a larger role for the desert pastoralists, it certainly developed into an intensive industry by the mid-3rd millennium BCE at Feinan (Adams 2002; Hauptmann 2000; Hauptmann et al. 2009; Levy et al. 2002); however, if indigenous desert folk were involved in copper production at this point, they were already marginalized, perhaps working as wage laborers or some ancient equivalent, perhaps scavenging and trading (cf. Segal and Rosen 2011). The recent-day Arabian tribal group, the Solubba (Betts 1989), may offer a modern analog, trading and repairing scraps and offering various services in the seasonal round. To judge from the remains at Feinan, copper production by this period was closely attached to the urban core somewhat farther north.

Finally, beyond material culture, the intensification reflected in the dung layers at the Ramon I Rock Shelter, and other similar sites, may also tie into external connections. Earlier episodes of stabling at various rock shelters do not exhibit either the accumulation or the intensive reworking of the Late Timnian layers seen at the Ramon I Rock Shelter. We may speculate that animals too were raised partially for an external market.

Given the above picture of nomadic production and trade, the obvious

question is what did the nomads receive in exchange for their copper and copper implements, milling stones, shells, beads, and pottery? Some elite goods, like (rare) fine ceramic wares or gold beads, may have been obtained in this way. Some utilitarian pottery certainly moved from the settled zone to the desert, and there is movement of Mediterranean seashells into the Negev. However, in fact, there are very few components of the Timnian material culture assemblages which derive from the settled zone. There are strong hints, however, that organic materials and goods originating in the Mediterranean zone were imported into the desert.

At Dhuweila, in layers dated to the late 5th or 4th millennia BCE, Betts et al. (1994) document the presence of cotton; in the Central Negev, Shamir and Rosen (2015) identify fragments of linen textile, probably part of a sack, from the Ramon I rock shelter, well dated to ca. 3000 BCE, the Late Timnian. Both of these instances well reflect the import of textiles into the desert. In fact, no evidence for textile production, for example in the form of loom weights or spindle whorls, has been recovered from any Timnian site to date. It is notable here that by the 3rd millennium BCE in Mesopotamia, wool production was a major industry (e.g., Porter 2012). Shepherding for this industry has been postulated as a prime mover in the evolution of pastoral nomadism in the regions east of the Two Rivers (e.g., Lees and Bates 1974; Sumner 1986).

The presence of storage jars in the desert deriving from the north implies transport of goods, perhaps liquids (olive oil, wine?) or other agricultural goods (although dry goods, flour, or grain could be better transported in sacks). Bar-Yosef Mayer (1999:76, 165–166), suggests import of grain into South Sinai as early as the PPNB; ethnographically, 19th- and early 20th-century Bedouin regularly imported staple grain from the agricultural north. The large number of used milling stones at Late Timnian sites, with no evidence for other agricultural implements (excepting the agricultural enclave at the Uvda Valley), also accords with the idea of grain import. Then again, the absence of cereals among phytolith assemblages (A. Rosen 1995a; also cited in Rosen 2011a:36) might suggest that grain was not imported. The lack of systematic sampling for organic remains and the problem of preservation (and indeed attribution) of organic remains from sites with little accumulation remain obstacles to addressing this issue.

Beyond textiles and foodstuffs, one may only speculate that other goods were imported but did not preserve. Ethnographically, manufactured wood products are one possibility. Although skins and leather would have obviously been available to desert populations, manufacture of higher quality leather goods in the settled zone suggests another potential import which would not preserve.

Multi-Resource Nomadism, Core and Periphery, and the Rise of Economic Asymmetry

By the Late Timnian, household-produced goods for export had become part of a system of desert-sown relations to a degree greater than seen in previous periods, and production in the desert increased beyond the level of household consumption and reciprocal exchange. If the household remained the primary productive unit for Late Timnian society, that society was no longer based on a purely subsistence economy. The diversity and volume of Late Timnian economic activities reflect the evolution of this society from herding-gathering to multi-resource nomadism (Rosen 2003b; cf. Salzman 1972).

At the same time, the nomadic populations of the Southern Levantine desert increased greatly. Looking at long-term site frequency trends in the Negev, the 4th millennium BCE appears to mark a demographic transition from populations constrained by the local environmental parameters to those able to draw on considerably greater resources (Fig. 9.4; Rosen 1987). Examining site frequency graphs (Fig. 9.4), site numbers from the Late Epipaleolithic (Natufian-Harifian) through the 5th millennium BCE are simply low, perhaps reflecting some basic hunting-gathering carrying capacity, little impacted by the rise of early herding-gathering. The major increase in site numbers in the middle-late 4th/early 3rd millennium BCE, the Late Timnian Phase, represents some new threshold in population levels not exceeded until the rise of systematic and intensive run-off irrigation in the Classical era, some three millennia later.

The first towns and cities in the Southern Levant arose concomitant with these trends. These provide the larger context for the economic intensification in the desert. At one level, the linkages between these processes are obvious, but from another perspective, the implications are not. In exceeding some hypothetical carrying capacity, reflected in the earlier site frequencies, a dependence relationship developed between the desert populations and the settled. As the nomads exceeded that original carrying capacity, the desert populations were no longer economically autonomous, kicking into the ethnographic pattern of deep interconnections with the settled zone common to Near Eastern nomads to this day.

Epilogue: The Terminal Timnian and Collapse in the Desert

The issue of settlement continuity in the desert is fraught with methodological difficulties. The Early Bronze Age III¹⁷ in the Southern Levant is defined primarily on the basis of the presence of Khirbet Kerak ware, a ceramic type whose presence farther south is rare, even in sites known to incorporate Early Bronze Age III horizons, as at Tell Hesi (e.g., Ross 1979). Without the presence of Khirbet Kerak ware, the distinction between Early Bronze II and III is subtle, although certainly not impossible (Fargo 1979). However, given this subtlety, the reduced ceramic diversity expected of the much smaller assemblages from desert sites amplifies the difficulties in defining a possible Early Bronze Age III horizon in the desert. Notably, it is not possible to distinguish holemouth cooking pots chronologically.

Nevertheless, there are a number of lines of evidence indicating a collapse of the Central Negev Late Timnian pastoral complex. Beyond the absence of fossil indices reflecting Early Bronze Age III presence, either ceramic or other materials, there is a clear chrono-stratigraphic break between the Late and Terminal Timnian horizons in sites showing horizons from both phases. Saidel (2002b) noted a sterile horizon between the Late Timnian and Terminal Timnian (respectively EBII and Intermediate Bronze Age in his terminology) layers at the site of Rekhes Nafha. Similar, the Late Timnian layer at the Camel Site (Rosen 2011a:34–41) can be distinguished from the later accumulations of the Terminal Timnian. At the Ramon I Rock Shelter, the mass of some 60 cm of dung accumulation is well dated to ca. 3000 BCE in a very rapid accumulation. The Terminal Timnian single date of ca. 2400 BCE at the top of the section,¹⁸ associated with a much thinner accumulation, reflects both a chronological gap between the earlier and later phases, and a reduced level of rock shelter exploitation (Rosen 2013). Horizontal stratigraphy distinguishing between the loci of the different phases in some sites is also evident (Saidel 2002b), although the time difference in such cases is more difficult to ascertain.

Settlement patterns also contrast. Excavated Early Bronze Age II South Sinai sites, chronologically contemporary with the Late Timnian, show no Terminal Timnian occupations. Of the 13 Early Bronze Age (Late Timnian) sites investigated by Haiman (Saidel and Haiman 2014:100), only four contained Intermediate Bronze Age (Terminal Timnian pottery). The large Intermediate Bronze Age sites in the Central Negev, Ein Ziq, Be'er Resisim, Mashabe Sadeh, Har Yeruham, Har Sayad, etc. (Cohen 1999:83–298), show no Late Timnian horizons beneath them.¹⁹ These sites are much larger in size, some sites exceeding 100 rooms, and many with 20 or 30; they also differ considerably architecturally from the standard enclosure-and-attached-room pattern of the preceding periods, showing compounds of small courtyards, to be distinguished from the pens and enclosures of the Late Timnian (Fig. 9.7). Settlement patterns differ considerably as well (e.g., Cohen 1999:267–294;

Haiman 1996), the north-south axis of the earlier phase contrasting with the apparent east-west axis of the later.

Material culture contrasts also suggest a break, at least in the Central Negev, with new pot types and morphologies appearing in the Terminal Timnian (e.g., Cohen 1999:230–259), new types of copper ingots (e.g., Hauptmann et al. 2015; Segal and Roman 1999),²⁰ the disappearance of some lithic types, for example arrowheads and tabular scrapers (Rosen 1997:41–44, 75), and other changes in material culture (such as a change in the raw material used for milling stones).



Figure 9.7 Typical excavated compound from Ein Ziq. Note threshold in foreground leading to open courtyard and round structures. Note additional excavated round structures in upper background, beyond structure. Looking west. Rooms are roughly three meters in diameter.

Source: Photo by S. Rosen.

This is not to say there was no continuity between these phases of the Timnian, for there are clear elements of material and architectural continuity. Rather, that continuity is to be found elsewhere; there is a culture-stratigraphic (read demographic) break in the Central Negev.

The coincidence between the abandonment or collapse of Arad at the end of the Early Bronze Age II and the decline of the Late Timnian system in the Negev is too strong a pattern to attribute to coincidence. Several factors have been offered in explanation of the abandonment of Arad, including climatic

deterioration, invasion, and perhaps economic or political competition (Amiran 1986; Joffe 1993:79; Yekutieli 2006); for the pastoral nomadic system attached to Arad, serving as the gateway town for the desert pastoral system, the abandonment of the town seems to have effected the decline of the desert system. With no gateway or market for their goods, the desert pastoralists could not sustain the larger populations stimulated by the demands which initiated the system. The collapse of the desert system, with its hundreds of sites, seems even more impressive than the collapse of Arad itself.

That some alternative market did not replace Arad for the desert nomads in the Early Bronze Age III, in spite of the presence of Early Bronze Age III sites on the periphery of the settled zone, like Tel Halif, Tel Hesi, and Bab Edh Dhra, suggests larger structural changes, that the entire Central Negev system itself was no longer sustainable. The intensification of copper exploitation in Feinan in this period, perhaps tied more directly to the urban settlements of the Mediterranean zone, or perhaps to sites on the eastern side of the Dead Sea, like Bab edh Dhra, eclipsed the earlier system. Greater Egyptian presence in Sinai probably also played a role (e.g., Amiran 1986; Miroshedji 2014; Stager 1992). The traditional nomadic answers to such dilemmas are sedentarization, fission and dispersal, and migration to greener pastures. The resuscitation of settlement with the Terminal Timnian system in the late 3rd millennium BCE reflects yet another set of changing geopolitical and economic circumstances. This too collapses by the beginning of the 2nd millennium BCE, paradoxically with the Middle Bronze Age reurbanization of the Mediterranean zone.

In short, the development of a complex system of relations between desert and town is succeeded by the collapse of that system, revitalization, and subsequent collapse. This dynamic of development and collapse is a motif that returns successively through the history of these deserts.

Notes

- 1 Rothenberg and Glass (1992) divide their Sinai-Arabah Copper Age, which seems to be congruent to their version of the Timnian (defined initially according to the lithic assemblages) into three phases: Early, Middle, and Late, based on the petrography of ceramics. These correspond roughly to the Chalcolithic (late 5th–mid 4th millennium BCE), the Early Bronze Age I–II and maybe III (mid 4th–mid 3rd millennium BCE), and Early Bronze IV (late 3rd millennium BCE). That is, their phases are out of sync with those outlined in this work, their Early Phase equivalent to Middle Timnian, their Middle Phase equivalent to Late Timnian, and their Late Phase equivalent to Terminal Timnian. Based on ceramic petrography, it is clear that their sequence could not include the pre-ceramic phase of the Timnian, and so they have lost the earliest phase of development. Notably, of

- course, they explicitly focus on the technological development of metallurgy, but the culture associated with metallurgy in the desert in fact pre-dates copper. In general, the use of petrography for dating would seem to be methodologically flawed since it reflects the use of tempers in pottery, which may well reflect trade patterns and raw material exploitation rather than clear chronological trends.
- 2 Although the automatic assumption that all sites with holemouth jars or cooking pots be assigned to the Early Bronze Age II has been justifiably disputed (Sebbane et al. 1993), Haiman's surveys and excavations (Saidel and Haiman 2014) have demonstrated that the large bulk of these materials should indeed be attributed to this period, that is, the terminal 4th and early 3rd millennia BCE. In this, the Negev materials may differ from those of Jordan (Abu-Azizeh 2013, 2014), where chronological resolution is still too broad to be able to fit into the sequence reviewed here.
 - 3 Reversing the causality, Finkelstein (1990) claimed that the town of Arad actually originates in the sedentarization of nomads. He notes the similarity of Aradian courtyard houses with the "Aradian" structures found in the Negev and Sinai and assigns these latter to a nomadic society, thus linking the town to the desert. There is no mention of typical Timnian enclosure-and-attached-room architecture (by this name or any other), and no discussion of any of the material remains of the indigenous desert pastoral society of the region.
 - 4 Of course, one cannot rule out water storage either.
 - 5 The extension of urban Mesopotamian myth to the mobile and tribal desert societies of the Negev, and the Near East deserts in general, even given increased cultural connections, imposes a religious system and mythology deriving from state-level, agriculturally based society on mobile, tribal, pastoral peoples. If the religious systems of Mesopotamia reflect Mesopotamian social structures and mores, as they most surely must, then their application to desert societies, fundamentally different in so many aspects, requires major transformations. The myths of Mesopotamia cannot be simply attached to the desert.
 - 6 Henry (1995:358–361) lumps the Timnian into a single system, based on assumptions concerning a general Chalcolithic date for the culture complex. As indicated earlier, Jebel el-Jill is most likely Late Timnian, but this does not invalidate his general reconstructions, based on geography, site attributes, and lithics.
 - 7 Finkelstein's (1990) suggestion that Arad was, in fact, a case of nomadic sedentarization is overstated. The cases of spontaneous (as opposed to forced) sedentarization in the Near East seem to reflect individual or small-group integration into previously existing urban or rural frameworks (e.g., Barth 1961:1113–122; Marx 1992). Contrasts in economy, social organization, architecture, and material culture between Arad and Timnian society are too great to support this claim.
 - 8 Claims that Canaanite blades were by and large manufactured for threshing sledges (e.g., Anderson et al. 2004, 2006) have been disputed (Gurova 2013; Rosen et al. 2015).
 - 9 Almost every Early Bronze Age site in the southern Levant has tabular scrapers, although they decline with distance from the source areas (Rosen 1983b). Here I offer a site from the north, the center, the south, and across the Dead Sea.
 - 10 In the original report on the excavations at Arad (Amiran et al. 1978:58), the milling stones were described as basalt. This was later corrected to ferruginous sandstone (Amiran et al. 1997:55, 88).

- 11 The small size of the copper objects is to be noted, and the issue of collection strategies is important. Thus, Late Timnian (Early Bronze Age II) sites excavated by Haiman in the 1980s (Saidel and Haiman 2014) were not sieved, and the only copper objects were recovered from tumuli. On the other hand, at the encampments of Kvish Harif, Nahal Tsafit, and the Camel Site, all sediments were sieved through 2 mm mesh, making direct comparison methodologically reasonable. The contrast between the Middle Timnian (the former two sites) and Late Timnian (The Camel Site) is not a consequence of differences in recovery methods.
- 12 The phenomenon of decrease in site numbers as a result of influx into population centers, towns, and cities might be argued for the rise of the contemporary town of Arad, in the northern Negev. However, it is notable that Early Bronze Age II Arad is contemporary with the Late Timnian system, such that, in spite of population aggregation in Arad, there is a major increase in both site numbers and sizes in the desert.
- 13 Of course, the problem of absolute contemporaneity is also impossible to solve. The current state of research does not permit us to distinguish between two contemporary Late Timnian adjacent compounds or one occupied ten years after the other.
- 14 Based on analysis of radiocarbon date frequencies, Avner and Carmi (2001) claim that there is demographic continuity between periods in the general region. Their methods are flawed in assuming that frequency of radiocarbon dates offers an unbiased sample of settlement frequency. Thus, ratios of dates per period (as defined by material culture affinities) are 5.9 dates per Late Neolithic site, 1.9 dates per Chalcolithic site, undefined (0 sites) for the EBI, 0.2 dates for the EBII/III, and 0.1 dates per site for the EBIV. This variability is extremely large, reflecting a combination of excavators' predilections for collecting radiocarbon samples, and preservation of organics at different sites. It renders the method unusable and results deeply unreliable.
- 15 Tumuli in the Central Negev attributed to the Early Bronze Age II (Late Timnian) show a scarcity of grave goods similar to that of earlier phases (Haiman 1992a); however, Saidel (n.d.) has recently re-evaluated the chronology of these cairn fields and has concluded that they are best attributed to the Early Timnian.
- 16 There is some debate on the date of the domestication of the donkey. However, the number of *Equus* bones appearing in Chalcolithic sites in the Levant is limited at best, and sometimes the chronological attributions have been problematic. By the mid-4th millennium BCE, donkey bones are a regular occurrence in faunal assemblages and only then can the donkey be said to be integrated into Southern Levantine economies (Ovadia 1992).
- 17 The revision of the absolute chronologies for the Early Bronze Age (e.g., Regev et al. 2012) has shifted periodization boundaries back in time, but has not affected site attributions based on material culture affinities.
- 18 To be precise, the Terminal Timnian date was derived from the opposite section (the west section) of the test pit, but could be placed stratigraphically at the top of Stratum II.
- 19 There is a possible hint of earlier presence at Be'er Resisim in the presence of a few tabular scrapers, but they may have been scavenged from elsewhere (Rosen et al. 2014).
- 20 Hauptmann et al. (2015) note the presence of crescent-shaped ingots as early as the Early Bronze Age III in settled zone contexts, but they only appear in desert sites attributed to the Intermediate Bronze Age (Terminal Timnian). Given the new proposed chronology for the 3rd millennium BCE (Regev et al. 2012), it is possible that there may be some overlap

between the cultural horizon called Intermediate Bronze Age in the Negev and the Early Bronze Age III in the settled zone. Internal chronologies for the Intermediate Bronze Age (=EBIV=Albright's MBI, etc.) have not been constructed and this issue remains unresolved.

Text and Relict

An Essay on the Archaeology of Desert Pastoralism in the Historic Periods in the Negev

Prologue: The End of the Timnian Culture Complex

The end of the 3rd millennium BCE in the Near East is marked by major shifts in the structure of urban society. In the southern Levant, virtually all cities were abandoned, and the urban system was replaced by villages. In earlier histories, this abandonment was seen as the result of invasions by the ostensibly nomadic Amorites (e.g., Albright 1949:82; Kenyon 1980:121, 145–147; for critical review see Richard 1980), and the period was often characterized as one of reversion to nomadic lifestyles, often encompassed under the rubric “semi-nomads” (e.g., Dever 1980; Richard 1980). In later revisions to these early syntheses, collapse was attributed to climatic perturbations imposed on socially precarious urban adaptations, especially tied to the 4.2K climatic event (2200 BCE), an episode marked not only by desiccation, but by environmental instability (e.g., A. Rosen 1995b, 2007:143). Decades of systematic archaeological survey and salvage work has resulted in the discovery of scores of villages and hamlets attributable to this period (e.g., Edelstein et al. 1998), not evident in earlier periods with emphases on tell archaeology. With these discoveries, the Intermediate Bronze Age¹ in the settled zone should be more characterized as a rural village system than a pastoral nomadic one, and thus the collapse should be seen as a regression from city to village rather than city to campsite. Most recently, re-evaluation of the radiocarbon sequence in the Southern Levant (Regev et al. 2012) suggests that the entire period began perhaps 200 years earlier than previously assumed and lasted longer than the assumed 200–300 years, casting some doubt on both the coincidence with the

well-dated 4.2K event of rapid climate change (RCC) and the synchronisms with events in the rest of the Near East. However, the clear radiocarbon overlap between sites attributed to the Early Bronze Age III and some of those from the succeeding Intermediate Bronze Age suggests that this work still demands review, critique, and full integration into the archaeological sequences (see [Chapter 9](#)).

Unlike the settled zones in the Near East ([Figs. 10.1, 10.2](#) for maps of sites mentioned in text), the Intermediate Bronze Age in the Negev (the Terminal Timnian Phase) was not a period of collapse, but one of florescence. The largest sites seen heretofore in the Central Negev were founded in this period, and it is not until the development of systematic, large-scale run-off irrigation, in Late Antiquity, that sites as large as those of the Terminal Timnian appear again. The material culture similarities between this horizon and the preceding horizon(s) of the Early Bronze Age/Late Timnian in the settled zone are well evident in the ceramics, such that Dever (1980; Richard 1980) initiated the terminological change from Middle Bronze Age I (*à la* Albright 1949:80–83) to Early Bronze Age IV to make explicit the continuities between the horizons. The lithic assemblages also exhibit clear technological, typological, and organizational similarities from period to period in the North, especially in the continued use of Canaanite blade technology (Rosen 1997:59–60). In the South, ceramic continuities with the Early Bronze Age III in Jordan are also evident (Dever 1980), although new types also appear (e.g., Cohen 1999:230–259). With respect to the lithics, underlying technological and typological continuities are evident in the flake and blade tools, although both tabular scrapers and arrowheads drop out of the lithic repertoire (e.g., Rosen and Vardi 2014).

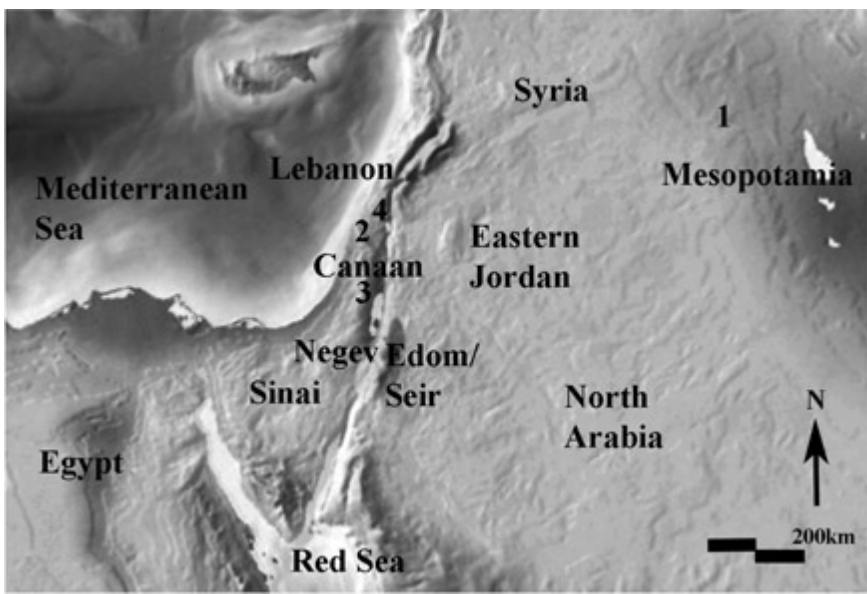


Figure 10.1 The Near East with areas and sites mentioned in chapter. 1. Mari, 2. Galilee, 3. Judea, 4. Tiberias.

These changes, along with the differences in settlement systems and architecture outlined earlier, and the chrono-stratigraphic gap within the Timnian/Early Bronze Age in the central Negev, indicate the need for denoting a phase change, hence Terminal Timnian. At a larger scale, the “missing link” between Late and Terminal Timnian may well be present in other regions sharing the earlier phases of the culture complex; nevertheless, in spite of the material culture continuities

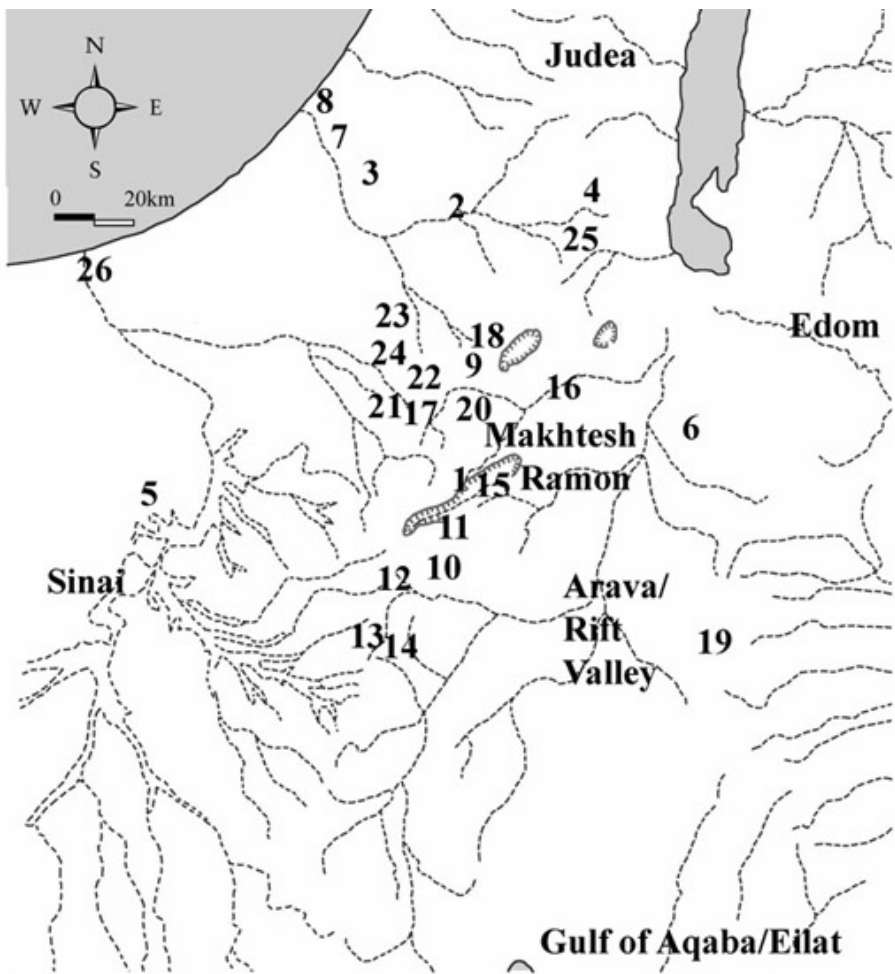


Figure 10.2 The Negev and surrounding areas with sites mentioned in chapter. 1. Atzmaut Rock Shelter, 2. Beersheva, 3. Gerar, 4. Arad, 5. Kadesh Barnea, 6. Feinan, 7. Qubur al-Walaydeh, 8. Gaza, 9. Sede Boker, 10. Be'erot Oded, 11. Nahal Oded/Har Oded, 12. Biqat Hisun, 13. Mt. Sagi, 14. Mt. Karkom, 15. Givot Reved/Ein Saharonim, 16. Ein Ziq, 17. Be'er Resisim, 18. Nahal HaRoa, 19. Petra, 20. Avdat, 21. Nizzana, 22. Shivta, 23. Halutza, 24. Rehovot-ba-Negev, 25. Mamshit, 26. El Arish.

with the preceding cultural horizon(s), like its cousins in the settled zone the Terminal Timnian (desert Intermediate Bronze Age) comprises a major change in social format. If the “regression” to village from city in the settled zone is paralleled by a “progression” from dispersed to aggregate settlement in the Negev, they nevertheless derive from the same historical processes. As an aside, it should be clear that larger-scale analyses, incorporating archaeological variability on smaller scales but over a large territory, in this case the differences between sedentary arable-zone adaptations and those of the nomadic desert zone, should confound simplistic environmental or climatic

deterministic approaches to historical explanation.

By ca. 2000/1950 BCE, the Terminal Timnian system had disbanded. In the desert, a few radiocarbon dates (Regev et al. 2012; Segal 1999) indicate that sites were indeed occupied until the end of 3rd millennium BCE, but did not extend much beyond it. The end of this system thus coincides with the reurbanization of the Middle Bronze Age in the Mediterranean zone, but of course, much as the northern collapse/southern florescence was no coincidence, nor was the northern resurgence/southern collapse at the beginning of the 2nd millennium BCE. If the social, political, and economic contexts of the late 3rd millennium BCE spurred the evolution of Terminal Timnian society in the desert, then the collapse of those contexts, as odd as it might seem to call the reemergence of urbanism a collapse, resulted in the collapse of that desert society. As with the preceding Late Timnian society, Terminal Timnian society was integrated into the larger regional context, in a real sense, dependent on that context. And as with that preceding Late Timnian society, Terminal Timnian society existed well beyond some hypothetical carrying capacity which might permit its continued presence in the desert without that context. However, unlike the Late Timnian succeeded by the Terminal Timnian, there was no Final Terminal Timnian, at least not in the Central Negev (and we have no evidence for anything of this sort elsewhere either). The 2nd millennium BCE in the Central Negev is devoid of evidence for pastoral presence,² and indeed, there is virtually no evidence for human occupation until the Iron Age, at the very end of the millennium. It is also notable that no claims for a 2nd millennium continuation of the Timnian, or even occupational presence, have been made in the Jordanian deserts either.

What Happened Next? 1. The Problem of the 2nd Millennium BCE

The Timnian Culture Complex represents the adoption, crystallization, and evolution of pastoral nomadism as a social and ecological adaptation to the deserts of the Southern Levant. If the origins and development of this adaptation are the primary focus of this work, pastoral nomadism as a dynamic adaptation did not end with the Timnian. The remainder of this chapter will offer a brief review of the archaeology of desert pastoralism through Late Antiquity.

The absence of archaeological remains in the central Negev for most of the 2nd millennium BCE poses a twofold problem for archaeology. First, various

texts, both contemporary Egyptian texts and the Bible, in the patriarchal narrative and the story of the Exodus, would seem to imply that people were present, sometimes in large numbers, in various parts of the Negev in the mid to late 2nd millennium BCE. Second, conceptually, the idea of a near-millennium long gap in the archaeological record in an area not far removed from the re-urbanized Mediterranean zone demands a convincing explanatory framework, especially in light of the presence of earlier Timnian settlement systems. In fact, these two issues, the meaning of absence and the meaning of texts, comprise the two overarching methodological questions for all later studies of desert pastoralists, excepting perhaps recent ethnographic times (where absence is not a question). The two issues are interconnected and recurrent. In the absence of archaeological remains and the absence of texts, the issue (in the post-prehistoric periods) of pastoral nomadic history does not arise; in the presence of texts and the presence of archaeological remains, as in classical times and in the ethnohistoric past, the primary issue is reconciling the sets of complementary data, not always a simple issue, but not of the same order as the contradictions evident in the 2nd millennium BCE, in the absence of archaeological remains and the texts implying presence.

Addressing the issue of the texts first, the biblical text, especially the early books recounting the narratives of the Patriarchs/Matriarchs and the Exodus in the desert, must be distinguished from contemporary texts, most notably Egyptian conquest lists and the el-Amarna letters, temple chronicles, execration texts, etc. With respect to the Bible, over 100 years of critical scholarship have well established the problems of accepting accounts in the Pentateuch as literal history. Beyond the fact that the Pentateuchal narratives as we have them today were written centuries after the events they describe, they are composed of multiple components from different origins, redacted repeatedly before synthesis into the (almost) final biblical text well into the mid-late 1st millennium BCE (e.g., Friedman 1987; for the Exodus see papers in Levy et al. 2013). The basic frameworks for modern biblical scholarship, incorporating the above processes, were first introduced well over a century ago by Wellhausen (1885); if they are still not accepted by fundamentalist religious scholars, they are nevertheless the starting point and mainstay of all critical research.³

The biblical accounts of Abraham and his offspring in the northern Negev, around Beersheva and Gerar, are riddled with anachronisms to the point where the details of the events, the geography, and the chronologies cannot be reconstructed to any scholarly agreement. Even events or characters for which/whom there is extra-biblical evidence for their historicity, lose that historical context when placed in the biblical account and cannot be reliably used to anchor other components of the text. A few examples will suffice to illustrate

the problem.

There is no consensus on the historical chronology for the events in the Patriarch/Matriarch cycle. If traditional scholarship has placed Abraham back in the first half of the 2nd millennium BCE, in the Middle Bronze Age, due to various cultural references in the texts (e.g., Bright 2000 [1946]:67–103), others place the events earlier, in the late 3rd millennium BCE, attempting to tie the stories into archaeological features (e.g., Cohen 1983; Glueck 1959:60–66). Thus, for example, assuming a Middle Bronze Age (early–mid 2nd millennium BCE) date for the Patriarchs, the appearance of camels in the stories, known to be introduced as domesticates in the region only in the Iron Age (Grigson 2012; Rosen and Saidel 2010; Sapir-Hen and Ben-Yosef 2013), comprises a clear contradiction which can only be resolved by placing the Patriarchs in a different historical context, that is, disputing the basic historicity of the text. Furthermore, the Philistines appear historically and archaeologically only at the very end of the 2nd millennium BCE in the region, although they are placed as contemporaries of Middle Bronze patriarchs in the biblical account. Stager (2006) resolves this in Hellenistic redaction of the text. In general, the mention of Beer Sheba also constitutes a problem because archaeologically there were hamlets in the area of the modern town in the Chalcolithic period, and in the Iron Age, but nothing in the period in between; as far as the eponymous⁴ wells appearing in the story, no wells or cisterns are known in the Negev until the Iron Age.⁵ In this context, it is important to reiterate that the Negev of modern Israel is not the Negev of ancient times, which referred, more or less, only to what today is considered the northern Negev. In the end, regardless of the disaccord between the archaeological record and the Genesis stories, the contradictions inherent in the stories themselves render them impossible for historical reconstruction or for use as examples of desert pastoralism (*per contra*, e.g., Kressel 2003:11–12).

Similar fundamental critiques can be levelled at the story of the Exodus and the wanderings in the desert as historical events (cf. Levy et al. 2013). Chronological and geographical inconsistencies render the story ahistorical. The Arad of the story of the Wanderings can be identified with Tel Arad based on the Arad Letters (e.g., Aharoni and Naveh 1981), but did not exist in the millennium prior to the Iron Age, when the Exodus must have taken place (if it did! but see Hoffmeier 2012). Indeed, the general geography of the Exodus is one of the 10th century BCE, not of the 13th, the traditional date of the escape from Egypt, as well evident in the dates of those few sites mentioned in the text which are in fact identifiable, as Arad (Aharoni and Naveh 1981) and Kadesh Barnea (Cohen and Bernick-Greenberg 2007). Historically, one might be able to link the Exodus to the expulsion of the Hyksos, a Semitic people who conquered lower Egypt in the 18th century BCE and were expelled in the

16th (e.g., Oren 1997); speculating, one might even be able to link the Hyksos to the Patriarchs/Matriarchs travels to Egypt and the Joseph story, but the Hyksos expulsion from Egypt ca. 1550 BCE, a date well fixed by Egyptian chronology, does not fit any standard chronology of the Exodus, all of which place the event in the 13th century BCE (e.g., Aharoni [1967:178–184] placed the Exodus in the early–mid 13th century BCE). Unlike the earlier stories, however, the contradiction with the archaeological record is more pronounced and the stakes for believers much higher. There is no extra-biblical evidence for any of the specific events associated with the Exodus and all explanations require special pleading and exception. Unlike the Patriarch/Matriarch narratives, the account of the Desert Wanderings depends directly on the miraculous. Accepting the presence of large numbers of post-Exodus Israelites at Kadesh Barnea, Bruins (1986:186–187) acknowledges the necessity of divine intervention to explain the history. Narratives which demand divine intervention in order to justify their historicity are not historical.

Beyond its direct relevance (or irrelevance) to the issue of desert pastoral presence in the 2nd millennium BCE, the above excursus into biblical narrative illustrates the power of mythic text, in this case the Bible, to provide the backdrop for all later interpretation. Cherry (2003) and Renfrew (1980) have noted a similar effect in the archaeology of Greece, as it freed itself from Homer, a notably less ideologically powerful text. The power of the mythic text is such that even for those who reject it, the structure of the rejection is guided by the reaction; the mythic text cannot be simply ignored. Interpretations of the extra-biblical texts, the contemporary documents, are placed into a backdrop defined by the biblical narrative. Thus, for example, the assumption that Iron Age forts and settlements in the Negev were built by sedentizing nomads (Finkelstein and Perevoletsky 1990) demands the earlier presence of hyper-mobile nomads, who did not leave remains. Their putative existence is supported by Egyptian texts referring to nomads called the Shasu, texts which make no mention of the Negev or features associated with it, and by the implications of the biblical backdrop, rejected or not, in which the Amalekites, the Aradians, etc., and the children of Israel were all in the desert after the Exodus.

Beyond the Bible, the Habiru (Apiru) and the Shasu, appearing in various late 2nd millennium texts, have been characterized as pastoral nomad groups in different regions in the Levant and the Near East. For our purposes here, the geography and characterization of these groups are the prime issues. There is scholarly consensus (e.g., Givon 1971; Gottwald 1979; Rainey 1987a; Redford 1992:269–273) that neither term is specifically ethnic, although *habiru* may have transformed in a later stage of linguistic evolution to be “Hebrew” (Na’aman 1986). Both terms seem to refer to socio-economic classes of people,

the names implying both a general rank in the larger societies, and perhaps a functional role (cf. Giveon 1971; Hopkins 1993; Rainey 1987a), much as the term “Bedouin” implies both a place outside the settled peoples, and mobile pastoral lifeways. Needless to say, neither term, Habiru or Shasu, should be equated with “Bedouin”.

References to the Habiru appear throughout the Near East dating from the 18th through 11th centuries BCE (e.g., Na’aman 1986). They are described variously as extra-urban, nomadic, brigands, mercenaries, etc. (e.g., Bottero 1954; Giveon 1971). They are well embedded in the settled zones of Near Eastern civilizations, and are not linked to either the deserts or the peripheral zones. They are not associated with pastoralism (Rainey 1987a). They do not offer any contradiction to the absence of archaeological remains in the Negev in the second millennium, nor for that matter to the apparent absence of sites in the Jordanian deserts during this period either.

In contrast to the Habiru, the Shasu were initially southern Levantine, especially associated with Edom and Seir, in Jordan (especially Giveon 1971; Ward 1972), although associated in some texts with areas as far north as Lebanon and Syria (Astour 1979, 1989), and also found in Canaan and Egypt (Ahituv 1984; Hopkins 1993). Almost all references to them are Egyptian, the earliest apparently dating to the 15th century BCE, although Ward (1972) makes a case for references as early as the 3rd millennium BCE; by the 12th century the primary references cease, and references appear as archaisms or with modified meanings (Giveon 1971; Kitchen 1972). The characterizations of the Shasu are broad and they are described as brigands or raiders (Giveon 1971; Redford 1973; Ward 1972), soldiers or mercenaries (e.g., Giveon 1971; Rainey 1987a,b; Ward 1972), pastoralists (e.g., Bien-kowski and van der Steen 2001; Hopkins 1993; Rainey 1994; Redford 1992:273), extra-urban (Fritz 1981; Rainey 1994), wandering or nomadic (Rainey 1994; Drews 2000; Gottwald 1979; Worschech 1997), desert dwellers (Goedicke 1966; Ward 1972, 1994), and foreigners (from the Egyptian perspective) (Giveon 1971; Kitchen 1972; Ward 1972). They clearly have chieftains (e.g., Giveon 1971:255–257; Kitchen 1972), and one of the later references refers to them as tent-dwellers (Drews 2000; Kitchen 1992; Weippert 1974). Some texts refer to them as sheep and goat pastoralists (e.g., Hopkins 1993; Weippert 1974; Younker 1999), and the presence of ox carts in association with the Shasu indicates cattle as well (Drews 2000). Significantly, although one 12th-century text (as above) refers to the Shasu as tent-dwellers, others make clear reference to sedentary sites, tells (Giveon 1971:114–115; Kitchen 1964). Based on their interpretations of their excavations of mining camps at Feinan, Levy and his colleagues (Levy et al. 2004) have recently suggested that the Iron Age cemetery reflects Shasu involvement in mining activities there, and the formation of Edom as an archaic state. Others

link the Shasu to early Israelite origins, either directly or indirectly (Rainey 1994, 2007; Redford 1992:269–273), by way of references to the Shasu of Yahweh, although there is little consensus on this.

For our immediate purposes, two points are to be emphasized: 1. The reference to cattle (to distinguish from a cow or two on a farm) would seem to rule out Shasu presence in the deep desert, at least with the cows because cattle are ill-equipped to survive in the deep arid zone, and 2. In spite of references to the *desert*, there is no evidence, no textual references, for presence in the central Negev beyond supposition; Givon (1971; also Ward 1972) explicitly associates the original Shasu territories with areas east of the Rift Valley (as well as north [Astour 1979]), with references to regions farther west associated with activities such as raiding, special migrations, and work as mercenaries. Thus, there is no evidence for Shasu residential presence in truly arid areas, and to reiterate the geography, the central Negev is considerably drier than the areas in the highlands of Jordan directly to the east of the Rift Valley. One must emphasize here as well that the ancient biblical Negev, for which there is evidence of Shasu presence in the later stages of their chronology (e.g., Bienkowski and van der Steen 2001), was restricted to the steppe zone of today's northern Negev.⁷ Thus, the texts offer little real contradiction to the archaeology, either in the Negev or, for that matter, in the eastern desert of Jordan.

A Digression: Texts, Archaeology, and the Bedouin

In the desert regions the contradiction between the scarcity of archaeology and the textual implications that people were present is resolved by better reading and/or interpretation of the texts. In other areas, there can be little question that the texts reflect the presence of apparently mobile peoples, like the Shasu or perhaps the Habiru (although the issue of the Habiru as pastoral nomads is not clear at all), but the archaeology reflecting that presence is lacking. On the surface, resolution can be achieved by the methodological trick of denying the efficacy of archaeology for investigation of nomadic peoples (see [Chapter 4](#)), or perhaps claiming that in the settled zone, camps are less evident due to vegetation, destruction, burial, etc. As per the previous discussion, this is an unsatisfactory explanation given the clear presence of the archaeological relicts of nomadic peoples in periods prior to history,⁸ both hunter-gatherers and pastoralists, both in the desert areas and in the settled zones. This problem is

not unique to Levantine archaeology in the Near East, but is, for example, also most evident in the Mari archives (e.g., Kupper 1957; Luke 1965; Matthews 1978; Rowton 1974, 1977), with over 400 textual references to nomadic and tribal groups, but lacking any corresponding archaeology. Porter (2012) has posited the ubiquitous presence of nomadic groups in the early ancient Near East, and has made a strong claim that these groups were integral to the rise of the great Mesopotamian civilizations, from Sumer on. Alizadeh (2008, 2010) has claimed that pastoral nomadic groups were the basic social matrix from which urbanism evolved in the Zagros.

Resolution of these apparent contradictions does not lie in denying the efficacy of the archaeological record; rather, we need to reconceptualize what nomadic lifeways in the ancient Near East actually were. The stereotypical paradigm of the Bedouin clan or household, living in a house of hair (*beit al-sha'ar*, black tent), migrating 400 km in a season in search of pasture and/or water, fundamentally autonomous and leaving little footprint, is not a true picture even in modern times, let alone in ancient times (e.g., Marx 1992, 2006; cf. Khazanov 1984; Salz-man 1971, 1972, 1999). Recent ethnography can provide no general models for pre-camel nomads, for nomads without tents, without guns, without Islam, without coffee (!), before iron, and with seemingly only limited access to bronze and copper; yet, these were the nomadic peoples of the Bronze Age.

Our preconceptions are embedded in our language. Words denoting mobility in ancient languages do not necessarily mean modern mobility in the sense of the Ruwalla, the al-Murrah, the Bakhtiari, or even the *arab* al-Ḥġerāt, who in the 19th and early 20th centuries migrated perhaps 20 km seasonally in the Galilee (Eloul 2010). In his classification of pastoral types, Khazanov (1984:17–24) distinguished a range of kinds of mobility, significantly noting various kinds of mobility where only a part of the social group moved with the herds, as in herdsmen husbandry and yaylag pastoralism. In spite of the presence of variability like this among pastoral groups in the modern Near East (e.g., [Chapter 3](#); Behnke 1980; Johnson 1969; Marx 1967), such models have been eschewed by historians and archaeologists of the ancient Near East, by default more than anything else.

A similar picture obtains with respect to dwellings. The ubiquity of the black tent sets the default, yet there is tremendous variability in nomadic residential types in the Near East. Magid (2008) reviews this great variability, from hair tents to mat huts, brush huts, and permanent mudbrick structures among the nomads of Sudan. Watson (1979:236–262) has described how entire mudbrick villages were seasonally abandoned in southern Iran in the 1950s. Even within tents, there is great variability, such as the difference between the external frame tents (yurts in Central Asia) of the desert nomads depicted in Assyrian

reliefs (e.g., Barnett 1976: pls. 32–33; Eph'al 1984; Ussishkin 1982:92–93, fig. 73) and the tensile (velum) tents, held up on poles and using cord and stakes. The modern black tent is a sophisticated technology and it is modern—it cannot be extrapolated back in time beyond a few hundred years (Saidel 2008a, 2009b). It is important to note that mobility of people does not necessarily imply impermanence to structures (cf. Haiman 1992b).

Yet, the texts do not constrain us to see ancient nomads as Bedouin, in spite of the ubiquitous use of the modern term *Bedouin* to describe, for example, the Shasu (e.g., Giv'eon 1971; Leonard 1989; Spalinger 2008; Ward 1972; Wentz 1963; Worschech 1997). In fact, the texts offer real alternatives. First, for example, the Mari nomads clearly live in villages, with permanent houses, and in many cases engage in agriculture. It is not clear at all from the texts what proportion of the population actually migrated seasonally. Furthermore, in the case of Mari, mobility does not equate with tents, *per contra* Fleming (2004:310, 2009), whose interpretation of Mari nomadic lifeways assumes the use of tents in spite of the absence of any word specifically signifying *tent* in any of the Mari documents. At least some of the Shasu live in villages (Kitchen 1964), and the reference to Shasu tent-dwellers in the 12th century BCE is, in fact, the earliest reference to *residential* tents in the entire region (Rosen and Saidel 2010).

The apparent contradiction between the texts and the archaeology disappears if the texts are not read in the context of modern preconceptions. If the Shasu are not seen as (stereotypical) Bedouin, in tents, then they can be placed in the villages and small towns of Late Bronze Age Jordan, and in the *hazerim* and hamlets of the Iron Age (northern) Negev, the single reference to tents notwithstanding (perhaps reflecting a seasonal dwelling, or a late adoption). If the Mari nomads are seen as villagers, then there are numerous small tells and settlements of a few hectares or less which can serve as the putative dwellings of the tribal groups appearing in the Mari archives. Lyonnet (2009; also Porter 2004 for 3rd millennium Tell Banat) goes even farther and suggests that the round towns of the second millennium BCE in the Syrian steppe were in fact nomadic centers. Fleming (2004) has made the strong case that these tribal groups were so integrated into Mari political organization that Zimri Lim himself was of tribal lineage. Mari was a city, but if it was a city of nomads (or semi-nomads, to use the popular term without real meaning), then why not villages and towns of nomads as well? One does not need to postulate invisible people on the steppe.

Nor is the point the actual identification of the Shasu. If Levy et al. (2004) have attempted to identify the Shasu in the mining camps of Feinan, there is really nothing beyond surmise to link the two. No texts indicate any connection between the Shasu, copper, mining, or Punon/Feinan, etc. But, if then again, the Shasu and other extra-urban groups who are identified with

mobile, pastoral, or simply non-urban lifestyles are not purely pastoral nomad in the stereotypical Bedouin sense, then Levy et al. (2004) have a point; if not the Shasu, then probably a group like them.

The problem of lack of isomorphism between archaeology and text is the classic problem of ethnicity in archaeology in the ancient Near East (e.g., Kamp and Yoffee 1980). The texts offer up lists of groups, classes, territories, and political entities, often vague, inconsistent in definition, dynamic over time, and incomplete in terms of the total number of such entities and their actual attributes and characteristics. Close critical, historical reading offers major historical insights, with consensus and non-consensus conclusions. At the same time, archaeology offers up its own parallel sets of data, artifacts, assemblages, sites, regional cultures, etc. We assume these parallel streams intersect at all particulars because we assume that both represent some fundamental historical reality. This is an unrealistic expectation given that 1. The different streams reflect different aspects of what happened in the past and if these aspects complement one another, they need not intersect to allow clear identity and integration, and 2. The assumption that there is some fundamental historical reality is not even acceptable for what happened yesterday, let alone in the deep past. In a similar structural framework, Clarke (1978:363–408) equated archaeological cultures with ethnographic ones, and in the same way, this equation too was untenable. Ethnography draws on knowledge so fundamentally different from that of archaeology that it is unrealistic to expect more than a partial match between the archaeological structures that we call cultures and those of cultural anthropology.

Resolution of this discord lies at the level of structure and process. Instead of naming names, of simply attaching a textually attested name to a site, a group, or a community, archaeological structures and processes (e.g., subsistence systems, trade connections, political or social organization, religious structures, etc.) need to be reconstructed and compared and contrasted to the parallel structures and processes reconstructed from the historical record. It is not really important at first blush that we be able to name the extra-urban villagers of Canaan Habiru, the miners of Feinan Shasu, or the inhabitants of 11th-century BCE Qubur al-Walaydeh Philistines (e.g., Lehmann et al. 2010). Ultimately these linkages will indeed offer new insights since the integrated picture they may offer will be greater than the individual parts, but premature linkages will serve only to obscure the richness and complexity of the overall historical record.

Explaining the 2nd Millennium Gap: A

Model for Absence (Read Decline, Scarcity, Abandonment, Etc.)

There was little human presence in the central Negev during the 2nd millennium BCE, nomadic or sedentary. The archaeological sequence shows an almost total absence of remains until the Iron Age, and the texts are in accord. A similar but less formally stated picture obtains for the eastern desert of Jordan. The scarcity of evidence for human presence is all the more marked given the abundance of evidence for human activity, in both areas, in the preceding 3rd millennium BCE. Such a long period of settlement nadir requires explanation.

In prehistoric times, for example in the period of the Last Glacial Maximum, or during early interglacial periods, hunter-gatherer occupation in the Negev was clearly constrained by harsh environments combined with the limitations of Stone Age technologies. Thus, to a large degree settlement florescence was tied to ameliorated environment (e.g., Goldberg and Bar-Yosef 1982; Goring-Morris 1987:41–44, 142, 422). For very early times, of course, one may posit biological constraints tied to human intellectual capabilities in terms of planning and abstraction which affected adaptive resilience in harsh environments. In addition, the climatic fluctuations of Late Pleistocene times were of significantly greater amplitude than those of the Holocene.

Within the Holocene, three periods of long settlement nadir in the desert can be defined: the mid 9th millennium BCE (corresponding to the Pre-Pottery Neolithic A in the Mediterranean Zone), the 2nd millennium BCE (Middle and Late Bronze Ages), and the Middle Ages, from ca. 1000–1700 CE. Other periods of demographic contraction are shorter, and seemingly of lesser geographic extent. Although these lesser settlement fluctuations are of interest, they seem to pose less of a conceptual dilemma, perhaps falling into some general process of short-term nomadic settlement fluctuation. Even if not, explanation of the larger fluctuations will offer general insights into the shorter ones.

The Desert PPNA lies beyond the scope of our discussion here, but notably both its predecessor (the Epipaleolithic Harifian) and successor (PPNB) societies were based on hunting-gathering, presumably bracketing any hypothetical PPNA desert adaptations, and thus especially susceptible to climatic fluctuations and, in general, the harshness of the desert environment.

The 2nd millennium settlement nadir in the desert¹⁰ does not correspond to any significant climatic or environmental fluctuation. In fact, quite the opposite, following the 4.2k RCC event which has been tied to urban collapse in the ancient Near East (cf. A. Rosen 2007:128–149 for balanced and non-

deterministic view of this collapse and the climatic causality in the Southern Levant), climate generally stabilized, certainly enough to permit re-urbanization in the Middle Bronze Age Southern Levant. If there are hints of climatic amelioration and fluctuations in the 3rd millennium BCE, settlement seems to cut across these fluctuations; the desert was arid regardless, and climatic fluctuations do not explain the settlement decline in the 2nd millennium BCE.

The Timnian system, both in its Late and Terminal incarnations, collapsed when it exceeded the basic carrying capacity of the region and the trade infrastructure which covered the deficit collapsed. The cause of that infrastructure collapse, tied in part to the abandonment of Arad, should be attributed to social and political trends external to desert peoples themselves. Changing political control of copper sources¹¹ may indeed be one of the primary factors involved in the decline of the Central Negev in the 3rd millennium BCE.

In the re-urbanization of the early 2nd millennium BCE, the crystallization of Canaanite culture and society, there was no resuscitation of the deep desert periphery; hence the gap. There are two points to consider, the first concerning the sedentary structures and configurations which might facilitate desert pastoral systems, and the second, the nature of the desert societies themselves.

The structure of urban civilization in the Middle Bronze Age in the Southern Levant, re-emerging after hundreds of years of village life, contrasted in a large range of particulars with that of the Intermediate Bronze Age, and in no way constituted a return to 3rd millennium Early Bronze Age urbanism. Major technological changes are coincident with this period, including, for example, fast wheel pottery and consequent typological changes, the introduction of the domestic horse and light chariots, the common use of tin bronze and consequent changes in weaponry, a technological shift in lithic technology, and major changes in architecture and fortification systems. New economic and geo-political structures are evident as well, for example in greater sea trade. In the adoption of bronze requiring massive quantities of tin, major trade systems with northern areas are evident, reflected as well in texts. Marked social inequalities are evident both in architecture and in burial patterns. Physical anthropology also suggests the likelihood of new populations added to the original groups of the region. In general, few connections to the desert are evident, although there is much trade with more northerly areas.

If copper was indeed the stimulus or trigger to much of the 3rd millennium desert trade and its attached pastoral system, then the virtual absence of evidence for copper exploitation at either Timna or Feinan in the early 2nd millennium BCE is telling. The rise of bronze, copper alloyed with 2–10% tin (again, coming from far north), may well have displaced much of the native

copper trade, offering a possible factor for the seeming abandonment of Feinan. South Sinai, the copper mining district, in this period is securely Egyptian (e.g., Hoffmeier 2012) with seemingly few connections to Canaan. Timna is also lacking in evidence for exploitation until late in the millennium, and then, also by Egyptians (e.g., Rothenberg 1972:63–111). Thus, between the changed political and economic orientations of the settled zones (including Egypt, with its control of South Sinai) and the abandonment and/or loss of the local copper sources, a major *raison d'être* for a desert pastoral system was simply not in place.

In contrast to earlier phases of the Timnian complex, after the Terminal phase, the system did not merely contract or regroup elsewhere. Thus, there is no evidence for Timnian-style architecture anywhere after the Terminal Timnian phase. To the best of our chronological abilities, surveys in Southern Jordan (or for that matter, Sinai) do not reflect continuity of the Timnian system into the 2nd millennium BCE (e.g., Abu-Azizeh 2013, 2014; Beit-Arieih 2003), and there are no post-3rd-millennium lithic assemblages elsewhere which resemble those of the Terminal Timnian, as at Ein Ziq (Vardi 2005) or Be'er Resisim (Rosen and Vardi 2014). The people themselves undoubtedly shifted locale, occupation, and ultimately identity.

What Happened Next? 2. The Origins and Development of Classical Period Nomadism

The next period of demographic florescence in the Central Negev, in the early Iron Age at the end of the 2nd millennium BCE or beginning of the 1st millennium, cannot be described as either nomadic or pastoral. No remains of campsites comparable to either those of the preceding 3rd millennium or the later Classical period have been documented, and the Iron Age horizon consists of sites which have been characterized as forts (Fig. 10.3:1–2) and homesteads, along with large water cisterns (Fig.10.3:3) (Cohen 1980; Cohen and Cohen-Amin 2004:151–153, photographs 9, 71). Small-scale agricultural terrace systems have also been attributed to this horizon (Bruins 2007). No rock shelter dung strata have been dated to this period either. Indeed, the horizon stands out in its contrasts to the well-documented periods of desert pastoralism both earlier and later.

This said, various scholars have suggested that this Iron Age horizon is either a case of nomadic sedentarization (e.g., Eitam 1980; Finkelstein 1984; Finkelstein and Perevoletsky 1990) or comprises a variant form of mobile

pastoralism, with massive structures subsidized by the state, citing an alleged absence of evidence for agricultural practice (Shahack-Gross and Finkelstein 2008) and reinterpreting various fortifications as pens. With respect to the former claim, the absence of Late Bronze Age remains of any kind in the region, either ephemeral campsites, rock shelters with dung layers attributable to this period, more substantial camps, etc., suggests that if the Iron Age horizon represents nomads settling down, they have moved to the region from elsewhere. The claim for a variant form of desert pastoralism is based on microarchaeological and sedimentological analyses from the Iron Age site of Nahal HaRoa which do not show evidence for agricultural practice (Shahack-Gross and Finkelstein 2008). Import of grain is postulated in order to support the population. By extension, the authors imply mobile pastoral life-ways. The arguments against these reconstructions are varied. The absence of sedimentological evidence for agriculture may well be a function of sampling; indeed Bruins (2007) has dated charcoal from sediments behind wadi channel terrace walls to the Iron Age (and not from the habitation sites themselves), indicating the construction of the walls prior to the accumulation of the sediments. Thus, the terrace walls, agricultural dams for run-off irrigation, would constitute strong evidence for Iron Age farming. In addition, the presence of sickle segments in Iron Age sites in the region suggests reaping (e.g., Cohen and Cohen-Amin 2004:142).



Figure 10.3 1. General view of Iron Age hill fort at Nahal Akrav after excavation, 2. Casemate walls of hill fort at Nahal Akrav after excavation, showing topographical location on top of steep hill, 3. Reconstructed Iron Age Nizzana Cistern (after rain) in the Central Negev, draining off Nahal Nizzana (now known as the Hemed Cistern).

The architectural remains do not seem to reflect any transition from mobility to sedentism,¹² nor do the locations of the sites, sometimes literally on tops of high hills (Fig. 10.3:1–2), and the interpretation of the courtyards of the forts primarily as pens ignores the clear defensive aspects of much of this architecture. Faust (2006) has also argued that there is no ethnographic model or precedent which would fit nomads as a source for the Iron Age horizon in the Central Negev, given the characteristics outlined above. It is notable in this

context that the argument that this Iron Age settlement system is a special variant of mobile pastoralism could be made as well to claim that it is a special form of desert farming. Regardless, the deep investment by the state in this settlement system and the massive public works (cisterns, forts), points on which all sides agree, set the Iron Age system apart from the preceding and succeeding nomadic pastoral societies, and beyond the scope of further discussion.

The Classical Period nomadic complex in the Negev evolved in Nabatean times. Although the Nabateans have long been assumed to have originated in a pastoral nomadic North Arabian tribe (e.g., Wenning 2007 for the difficulty of assessing origins), the historical sources for these origins are actually limited to a single text, a secondary recounting by Diodorus of Sicily (1st century BCE) of an earlier text by Hieronymus of Cardia (4th century BCE):

It is their custom neither to plant grain, set out any fruit-bearing tree, use wine, nor construct any house; and if anyone is found acting contrary to this, death is his penalty.... Some of them raise camels, others sheep, pasturing them in the desert.... for not a few of them are accustomed to bring down to the sea frankincense and myrrh and the most valuable kinds of spices, which they procure from those who convey them from what is called Arabia Eudaemon. They are exceptionally fond of freedom; and, whenever a strong force of enemies comes near, they take refuge in the desert, using this as a fortress; for it lacks water and cannot be crossed by others, but to them alone, since they have prepared subterranean reservoirs lined with stucco, it furnishes safety ...

(Diodorus Siculus XIX, 94; http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Diodorus_Siculus/19E*.html)

There is little reason to question the basic historicity of this text, but it is of note that by the time Diodorus was quoting Hieronymus, the Nabateans had already established a powerful Hellenistic kingdom encompassing most of modern Jordan, with its capital at Petra, controlling the spice trade and rivaling the Hasmonean Kingdom in Judea. Some of the particulars mentioned in the text, no stone houses, no grain or fruit agriculture, clearly no longer obtained.

Archaeologically, the Nabateans are most associated with Petra and other cities in Jordan and the Negev that they either inherited or established. In the Negev, they are especially noted for the development of the Spice or Incense Route, bringing a range of medicinal herbs, spices, perfumes, cosmetics, and incense from the tropics (South Arabia, India, and the Horn of Africa) to the Mediterranean. The Byzantine towns of Avdat (Oboda), Mamshit (Mampsis), Shivta (es Subeita), Nizzana (Nessana), Rehovot-ba-Negev (Ruheiba), and Halutza (Elusa),¹³ along with smaller settlements, were all founded, probably as caravanserais (e.g., Ein Saharonim [Cohen 1982]) or trade centers of one kind

or another, under the Nabateans (e.g., Shershefski 1991:2–3, 218–219). This is most evident, for example, at Avdat, where the alleged pottery workshop (Negev 1974) was undoubtedly a way station (e.g., Goren and Fabian 2008). The Spice Route itself can be traced in a series of caravanserais (e.g., Cohen 1982; Erickson-Gini and Israel 2013; Meshel and Tsafirir 1975) leading from Petra through the Arava and the Central Negev and on to Gaza, or later, el-Arish of the North Sinai Coast.

Judging from the texts, the Nabateans emerged out of North Arabia sometime in the mid 1st millennium BCE (e.g., Graf 1990; Healey 1989), but no archaeological research has been conducted in that region to corroborate the texts. In the Negev, Hellenistic precursors of the Nabatean settlements are evident (Erickson-Gini and Israel 2013), but identifiable Nabatean remains, as indicated by the unique Nabatean ceramic industry, are not present until the 2nd or 1st centuries BCE (at earliest). The remains of a Nabatean pastoral system seems to post-date the establishment of the trade system, to judge from the ceramics found in Nabatean campsites (Rosen 2007), which by and large date to the 1st and 2nd centuries CE. That is, the trade system pre-dates the pastoral system; the traders may well have been nomads, *à la* the Tuareg (e.g., Keenan 1977; Norris 1952; Palmer 1932), but their initial presence in the Negev was dictated by the spice trade and not by pastoralism. The infrastructure established by the trade system, initially comprised of caravanserais but ultimately including more permanent features such as small-scale farms (e.g., Rosen 2007) and ultimately towns, seems then to have served as the economic anchor for a pastoral system.

The Nabatean pastoral system is documented in the numerous and sundry campsites registered in the Negev Emergency Survey, summarized in Rosen (2007). Based on published surveys (http://www.antiquities.org.il/survey/new/default_en.aspx), 182 sites¹⁴ from 1,000 km² with characteristic Nabatean ceramics were classified into four groups architecturally: towers, rectilinear structures/settlements, round structures (hut bases), and camps (tent camps and ephemeral sites). Distribution analysis of the different site types indicated clear differentiation between the towers and rectilinear sites on one hand and the round structures and camps on the other, with the center of gravity for the “sedentary” sites located in the northern areas of the Central Negev (Fig. 10.4), and that of the “nomadic” sites in the more arid areas, farther south. Analyses of the *published* ceramics from these surveys also showed: 1. A clear decrease in number of sherds/site depending on the architectural type (towers = 6.5 sherds/site, rectilinear sites = 3.7, round structures = 0.8, and camps = 0.3), 2. In accord with the geographical trends in the architecture, there is a general decrease in published sherd density from north to south, from 4.7 sherds/site in the northern survey maps down to 0.4 sherds/site¹⁵ in the southern survey

maps, with no geographical reversals in between, and 3. A general increase in the percentage of cooking ware from north to south, corresponding to a similar pattern showing higher proportions of cooking ware relative to other ceramic types among the “nomadic” architectural types, and in general, a greater diversity of ceramics in the “sedentary” sites (Fig. 10.5). These patterns combine to demonstrate two basic systems in place in the early Roman/Nabatean period in the region, a pastoral system composed of round huts (compare to the Timnian sites, without the attached pens) and ephemeral camps (Fig. 10.6), and a sedentary system, including farmhouses and hamlets, towers (either military or perhaps agricultural in some cases), and assorted installations like cisterns and terraced fields.¹⁶ In addition to these sites, the Nabatean way stations (Fig. 10.7) and large sites, like Avdat, were not present in the actual survey maps, but of course should be considered in any larger picture (Fig. 10.8). In particular, the Nabatean pastoral system seems to extend farther north, with a greater concentration in the east than the later Byzantine/Early Islamic period pastoral system, probably reflecting the closer ties to the Spice Route (which by Late Antiquity was in significant decline).

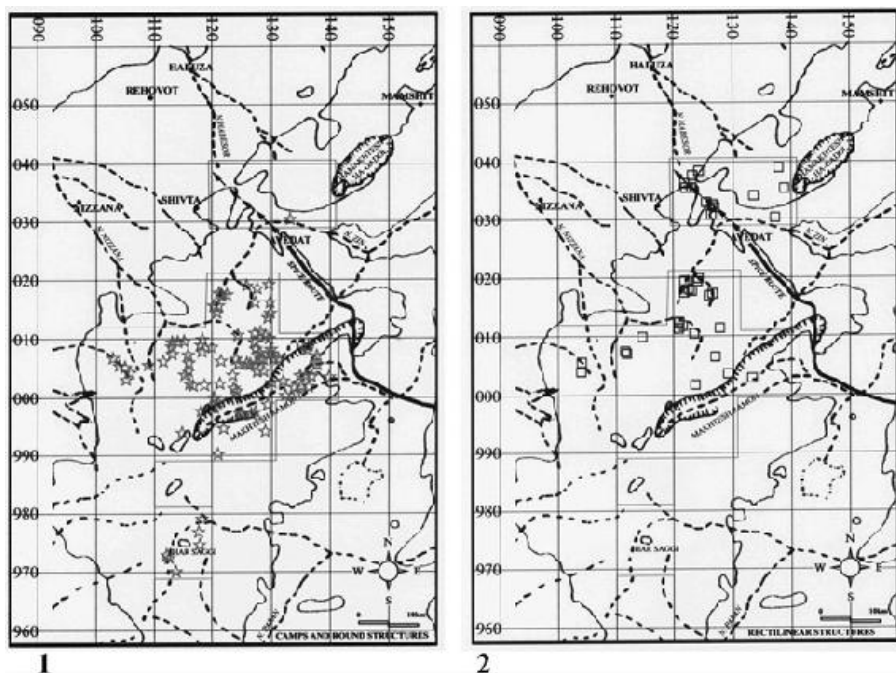


Figure 10.4 Nabatean settlement distributions (after Rosen 2007). 1. Distribution of sites with round hut architecture, tent camps (with tent outlines), and camps, with no architecture, 2. Distribution of sites with rectilinear architecture and evidence for walls to roof height. The contrast in distribution is most evidence in the northernmost areas, lacking hut and camp architecture and the southernmost areas, lacking rectilinear architecture.

Excavations at the Nabatean period tent camp of Givot Reved (Fig. 10.6, 5–6; Rosen 1993), in the *Makhtesh Ramon*, offer a more detailed view of Nabatean nomads. Judging from the patterns of stone alignments, probably used to hold down tent flaps and reflecting the location of tents, Nabatean tents were round,

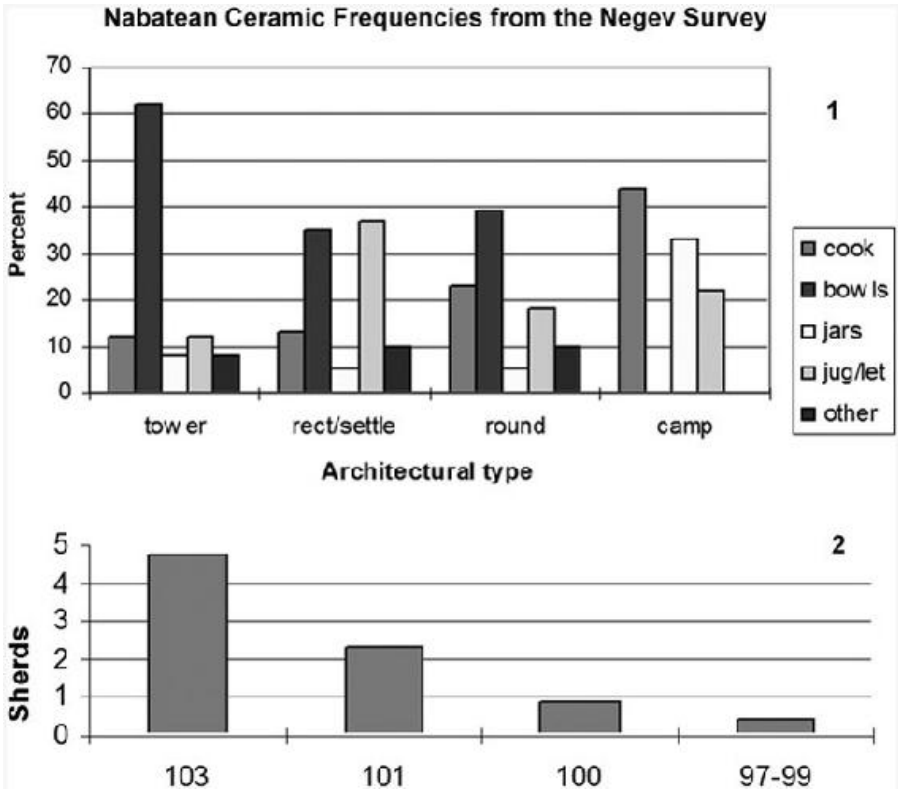


Figure 10.5 Nabatean ceramic class frequencies (after Rosen 2007). 1. Ceramic types frequencies according to architectural type. The dominance of cooking ware in the two “nomadic” architectural types (camps and round structures) is to be noted; 2. Ceramic sherd frequencies as a function of latitude, based on the Israel Grid (x-axis, the higher the grid coordinate, the farther north the site). Y-axis is average number of sherds collected per site during survey. There is a clear trend toward reduced ceramic density farther south and N-S location correlates with site type and mobility versus sedentism (Fig. 10.4).

and often double, forming a kind of figure-eight shape. Givot Reved consisted of at least six individual tents (three figure-eights) aligned along a terrace (above the floodplain and channel) of a wadi tributary to Nahal Ramon. Hearths, small bins, and other features were well evident in addition to the tents. Ceramic lamp fragments indicate a 2nd century CE date. Only 212 sherds were collected over the 525 m² of the scraped/excavated site,¹⁷ a density of only 0.4 sherds/m². In addition, typological study combined with refitting

suggests that only 10–14 pots were broken on the site during occupation. These are remarkably low numbers, especially when compared with the tens and hundreds of thousands of sherds usually recovered from larger contemporary sedentary sites such as Avdat (e.g., Negev

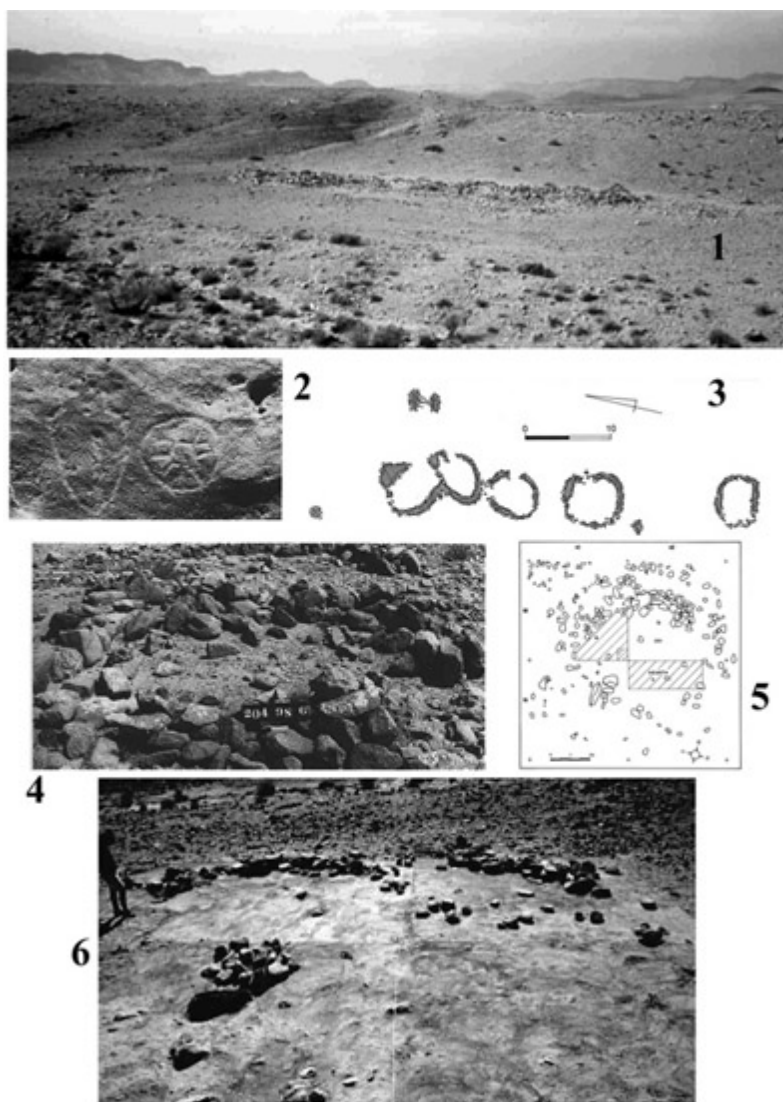


Figure 10.6 Nabatean nomadic sites. 1. Photograph of Site 204/93 (Rosen 1994) looking west (Photo S. Rosen), 2. Incised petroglyphs in proximity to Site 93, 3. Plan of Site 93, 4. Photo of structure from Site 93 (Photo S. Rosen) looking south. Structure is second from right in above plan, 5. Plan of locus 202 at Givot Reved, 6. Photo of Locus 303 at Givot Reved (Photo S. Rosen) looking west. Givot Reved has been interpreted as a tent camp (Rosen 1993).

1974, 1986), again an indicator of the contrasts in lifestyle between the mobile pastoral system and the sedentary system based on trade and farming. Not

especially surprising, all are imported, perhaps from Petra to judge from the wares. In terms of other material culture, only a single faceted quartzite pebble, a rubbing stone of some kind, was recovered. The absence of milling stones contrasts with both the earlier Timnian system and with later sites from the Byzantine and Early



Figure 10.7 Ein Saharonim caravanserai. 1. General view looking south. Note far right unexcavated; 2. Oven, looking northeast; 3. Stairwell, looking southwest; 4. Eastern rooms, looking north.

Source: Photos by S. Rosen.

Islamic periods, suggesting perhaps greater mobility in the absence of heavy

site furniture and plant processing. On the other hand, Givot Reved is the only such site thus far excavated, so it is not clear how representative it is of Nabatean nomadism from a larger perspective; it may represent only a seasonal camp, or perhaps a transit camp between two territories. In the meantime, we cannot know.

Beyond habitation sites and agricultural installations, based on intensive survey in the southern Negev, Avner (1999/2000) has attributed a large set of *massebot* (stelae, standing stones) to the Nabateans. If these are indeed Nabatean, then they add a significant component to the corpus of Nabatean sites that can be associated in one way or another with Nabatean nomads (there are few or no sedentary Nabatean sites in the general area of the survey). However, attributions are based on assumptions concerning Nabatean belief systems and geographic proximity and require verification of at least a sample based on excavations and proper dating techniques.¹⁸

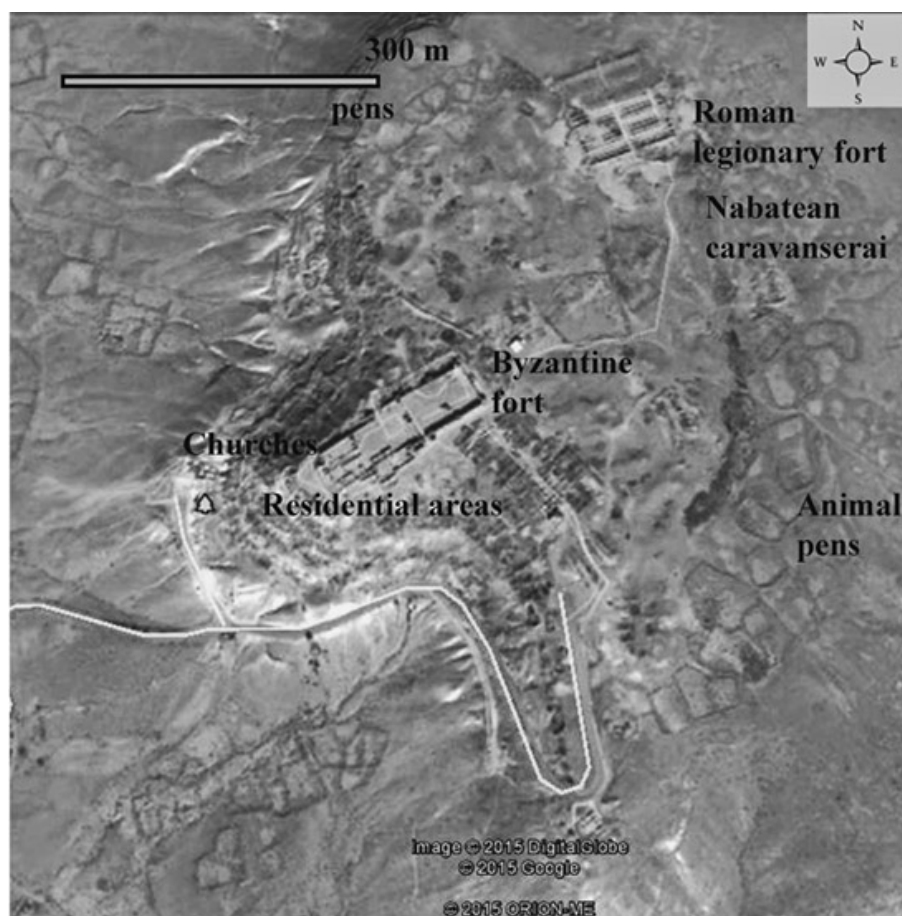


Figure 10.8 Google Earth photograph of Avdat with pens on eastern periphery.

The issue of Nabatean attribution also needs to be addressed. In fact, the use of the term *Nabatean* to describe the nomadic system described above is really a shorthand term based on the presence of pottery attributed to the Nabateans and probably produced in Petra, or perhaps other Nabatean sites. Bedouin in the Negev from the 18th through the 20th centuries CE used Gaza ware pottery (Israel 2006; Rosen and Goodfriend 1993), but this does not make them Gazans. There is little means of establishing ethnicity or any reliable cultural affiliation for these people. Given the major contrasts between the powerful and sedentary Nabatean kingdom and the nomadic system outlined here, it is reasonable to assume that even if the Negev nomads of this period and their sedentary cousins originated from the same North Arabian tribes, by this time the development of contrasting lifestyles had resulted in variants of the original identity. Of course, in this general period there are Thamudic and Nabatean inscriptions in the desert, as well as indigenous rock art, so the nomads may be a different people altogether; as per the earlier discussion in this chapter, linking up between the evidence streams is not yet possible.

Ceramic chronologies built from surface surveys of desert campsites do not provide optimal precision in dating.¹⁹ Nabatean pottery is fairly diagnostic, and *relatively* chronologically sensitive, allowing Nabatean nomadism to be distinguished from the succeeding block of time, the Late Roman-Byzantine-Early Islamic period. Given the small quantities and limited repertoire of pottery found in most nomad sites, this later block of some 500–600 years cannot be subdivided based on survey finds. There have been too few excavations of campsites from Late Antiquity, but excavation materials do offer finer-grained chronological resolution.

Surveys in the central Negev have demonstrated two overlapping but discrete settlement systems attributable to this long period, ca. 300–800 CE. a sedentary urban and village hinterland system based on run-off irrigation agriculture (Bruins 1986; Evenari et al. 1982; Haiman 1995; Kedar 1967; Mayerson 1960) and a nomadic pastoral system tied to the settled zone, but with its center of gravity farther south (Avni 1996; Haiman 1995; Rosen 1987, 1992b, 2006; Rosen and Avni 1993). The two systems are correlated with the environmental gradient tied to both altitude and latitude; the urban system with its hinterland is found farther north, in generally better-watered areas (or those with appropriate drainages for run-off irrigation), and the pastoral system farther south, in more arid areas. The areas around Mt. Sagi and Mt. Karkom, southerly but high, show a combination of the systems, with simple small scale run-off irrigation systems, but domestic sites with architectural and material affinities to the nomad societies defined in lower regions (Avni 1996; Rosen and Avni 1993).

The characterization of these two systems is similar to that of the Nabatean

systems, albeit more so. The sedentary sites are characterized by urban aggregates, the famous Byzantine towns of Avdat, Shivta, Mamshit, Nizzana, Rehovot, and Halutza. These sites, with populations ranging from about 1,500 to over 5,000 inhabitants (e.g., Rubin 1996, 1997), include multiple wine presses and olive processing features (evident most especially in the large wheels used in the presses), as well as multiple churches, multi-room domestic dwellings, complex architecture including elaborate decorative components, markets, and plazas (e.g., Shershefski 1991). Most show defensive postures, if not real fortifications. They clearly represent the adoption of Mediterranean urban culture deep into the desert (Rubin 1996, 1997; Shershefski 1991:227–228). These sites all show prior Nabatean settlement so that the evolution of desert urbanism in the Negev has been linked to those Nabatean roots (e.g., Negev 1983; Shershefski 1991).

The immediate hinterland of these towns includes massive agricultural complexes (raised terraces, sluice gates, support walls, drainage channels, etc.), wine presses, watch towers, cisterns, pens, threshing floors, and smaller settlements. The farther agricultural periphery includes lone farmhouses, hamlets, and less elaborate wadi terrace systems with adjacent threshing floors. Like the urban core, architecture is rectilinear, and structures were built of stone to roof height. This rural agricultural periphery extends up until the *Makhtesh* Ramon, and somewhat farther south in the western and higher areas (Haiman 1995; Rosen 2000; Rosen and Avni 1993). Beyond this periphery, in addition to tribal presence, for example in Sinai, there are monastic settlements which functioned both as autonomous religious sites (albeit often with state support) and the foci of pilgrimages (Mayerson 1994). Based on surveys and excavations, Dahari (2000) estimates a population of hundreds of monks, in a range of site types from large monasteries to hermits' dwellings (cf. similar settlements in the Eastern Desert of Egypt [e.g., Lassányi 2012; Sidebotham et al. 2002]). The subsistence base of these settlements seems to have been small-scale horticulture based on run-off irrigation and wells.

Like the preceding Nabatean system, which it resembles in many particulars, the Byzantine/Early Islamic pastoral system consists of various kinds of camps and campsites, comprised of round hut bases and stone alignments representing tent camps (Fig. 10.9; also see Banning 1986 for Jordan). The larger aggregate camps cluster in and south of the *Makhtesh* Ramon (Rosen 1987), notably beyond the distribution of agricultural systems (terrace dams, cisterns, threshing floors). The exception to this is in the highest areas (as above) where “nomadic” architecture is found in association with simple run-off irrigation systems (Avni 1996; Rosen and Avni 1993). The hut bases do not exceed two courses of field stone in height (excluding more recent Bedouin re-use and repair), and excavations at the Oded Sites (Fig. 10.10;

Rosen and Avni 1997) and Biqat Hisun (Avni 1996; Rosen and Avni 1993) indicate that the more elaborate ones are dug into the ground, sometimes up to 40–50 cm with the holes lined with the first course of upright stones, so that they are really pit houses (Fig. 10.9). They may represent either foundations for brush huts or perhaps winter tents, if modern ethnography offers clues to architectural function (e.g., Goren-Inbar 1993). These structures may vary in size from 2–3 m in diameter to as large as 8 m across, the larger ones perhaps representing public structures (perhaps something akin to a *shig*, a Bedouin public tent) (Fig. 10.11, 2). Like the Nabatean camps, the later period structures align along terraces adjacent to channels of wadis tributary to the major drainages. The largest of such camps may include dozens of such round structures (Fig. 10.10; Avni 1996; Rosen and Avni 1993, 1997), although the smaller camps may consist of only a single structure or tent base. These are distributed over a larger area, suggesting a pattern of geographical dispersal and aggregation, presumably seasonal. Paradoxically, pens are rare in the southern areas of nomadic aggregation, but are not uncommon in the northern agricultural zone, for example in the immediate environs of Avdat (Fig. 10.8; e.g., Shershefski 1991:48), perhaps an indication of the need to prevent grazing on agricultural fields in those areas.

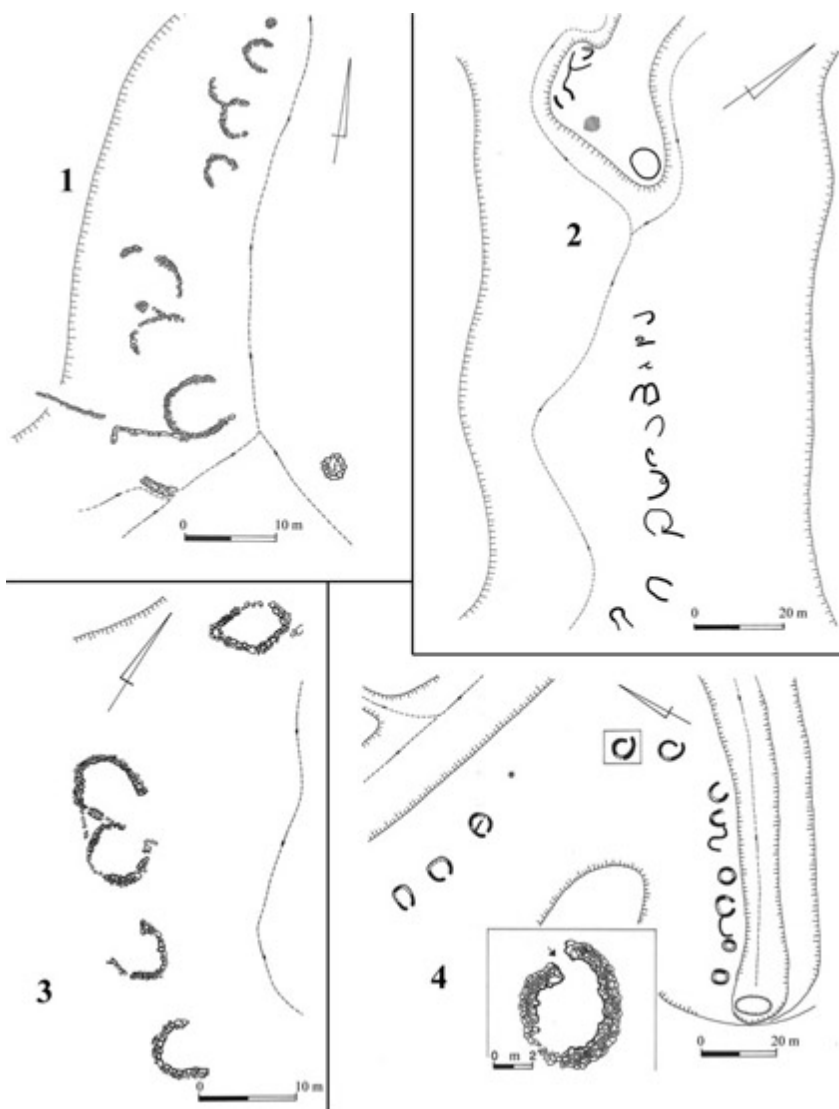


Figure 10.9 Site plans from Classical Period nomadic sites from Archaeological Survey of Israel Map 204 (Rosen 1994). 1. Site 66, 2. Site 72, 3. Site 70, 4. Site 206.

The architecture of the large camps reflects a greater labor investment than one usually associates with nomadic societies (but see, for example, Watson 1979:236–262 for seasonal abandonment of entire mudbrick villages). However, the ceramic assemblages show a dominance of cooking ware over storage ware, contrasting greatly with sedentary sites (Rosen and Avni 1997:figs. 7.1–2; also Saidel 2002/4) and indicating a functional difference which can reasonably be interpreted as a greater degree of mobility. Of course, the absence of agricultural fields in the vicinity of the Oded sites²⁰ indirectly supports the idea of essentially pastoral subsistence.



Figure 10.10 Site Plans, Nahal Oded and Har Oded. 1. Plan of Tent Camp A, Har Oded, 2. Photograph of Tent Camp A (S. Rosen), looking northwest, 3. General plan of Nahal Oded (Rosen and Avni 1997), 4. General plan of Har Oded (Rosen and Avni 1997), 5. Photograph of Locus 20, Nahal Oded, looking east (S. Rosen), 6. Plan of Locus 102, Har Oded.



Figure 10.11 Large (public?) structures from Nahal Oded. 1. Locus 1 Nahal Oded, looking west, 2. Locus 2 Nahal Oded, looking northeast.

Source: Photos by S. Rosen.

The faunal assemblage recovered from test excavations in a small midden at Nahal Oded shows a dominance of goats/sheep, with the presence of quail, chickens, chicken eggshells, fish and Nilotic mollusk shells. The fish bones undoubtedly reflect trade in dried fish, and the mollusk shells connections with Egypt (Horwitz et al. 1997).

The material culture recovered from excavations at the Oded sites, dated to the Late Byzantine and especially the Early Islamic periods, offers a picture of

close connection with the settled zone (Rosen and Avni 1997). With the exception of a very few handmade, locally produced pots (cf. Negbite ware [Haiman and Goren 1992]), all ceramics are typical Late Roman/Byzantine wares and types, clearly imported from sedentary manufacturing centers (e.g., Halutza [Arubas and Goldfus 2008]). Rotary milling stones of sandstone and basalt were also imported, the basalt clearly imported from some distance, either northern Israel or Jordan. The presence of the milling stones, in the absence of evidence for systematic agriculture, suggests import of grain which was then ground to flour on site. Notably, given the proximity of the agricultural zone, perhaps only 10–20 km distant, this is not long-distance import. An iron axle embedded in one rotary stone obviously indicates manufacture well beyond the capabilities of these pastoral groups, indicating trade. Similarly, fragments of glass and bronze also reflect external connections. In fact, virtually the entire material culture recovered derives from beyond the nomadic zone (admittedly, the materials comprise only non-organic materials due to the problems of preservation). A single coin, minted in Tiberias ca. 700 CE, also indicates ties to the settled zone (Amitai-Preiss 1997). In fact, at the site of Nahal Oded, the presence of a well-constructed rectangular building (with a radiocarbon date of ca. 700 CE., of hewn blocks, with walls built to roof height (Fig. 10.11), suggests the presence of non-indigenous peoples in the midst of an otherwise-typical large pastoral encampment, perhaps traders, perhaps government representatives of some kind. The ancient wells, Be'erot Oded (*Abar Idied*), cut into bedrock to reach the aquifer, are located about 4 km south of the Oded sites and undoubtedly date to Classical Antiquity. These too most likely reflect external presence since the excavation of wells is usually not associated with mobile groups.

The Oded sites also included two open air mosques, part of a larger Central Negev assemblage of mosques dating to the very origins of Islam (Avni 1994). Geographically, the location of the mosques, almost all in the pastoral periphery of the Central Negev, with only a single one present at Shivta among the urban sites, suggests that the nomadic tribes of the region adopted Islam quite early in its evolution. The Muslim burials at the site of Nahal Oded—feet in the east, head facing south toward Mecca, and depth appropriate to age of the interred (Rosen and Avni 1997:13, figs. 4.8–10)—also link these sites to early Islam, or even to the transition from Byzantine paganism (in the presence of other apparently associated cult features) to Islam. Finally, Arabic rock inscriptions dating to the 7th–9th centuries CE are best attached to sedentary society (e.g., Sharon 1990; *per contra* Nevo et al. 1993); other rock art in this period, generally attributed to desert pastoralists (although whether in this period they are pastoralists attached to villages or mobile is unclear), also shows a clear shift toward depictions of the abstract, an attribute associated

with Islam, again linking these pastoralists to early Islam (Eisenberg-Degen and Rosen 2013).

Unlike the Nabatean case, with its single reference to the Nabateans as desert nomads, or the earlier references to the Shasu, by Late Roman times there are numerous contemporary references to various pastoral and nomadic groups in the deserts of the Near East, and the southern Levant in particular. Mayerson (1994) has summarized those directly relevant to the southern Levantine deserts in a series of studies drawing on travelers' accounts, narratives, economic texts, histories, and geographies.

If on the one hand there are disagreements over the interpretation of the basic tenor of relations between the desert tribes, generic Saracens, and the Roman/Byzantine Empire (e.g., Avni 1996; Banning 1986; Mayerson 1989a, 1994; Parker 1986, 1987), in fact the texts and the archaeology complement one another and differences are in the large-picture interpretations. There are no questions, as per the Shasu, as to whether there were nomads present. Thus, the texts inform us that there were nomadic tribes beyond the settled zone, and this is well confirmed by archaeological survey. They indicate that relations included hiring the nomads as guides for pilgrimages and travel in the desert, trade in camels and donkeys, and subsidies for protection of the borders. This was a common strategy for the Roman Empire in its dealings with nomads on its desert borders (e.g., Shaw 1982). The texts refer to chiefs and multiple groups, reflecting a tribal organization, *sensu lato*, in the desert in these periods. One account (Mayerson 1989b) refers to the Bani al Udayyid tribe somewhere south of Nizzana (Nessana) on the pilgrimage route to South Sinai; the Arabic name for the Hebraicized Be'erot Oded, Abar Idied, is undoubtedly a relict association from this tribal group. The texts also inform on tensions, raids, and massacres (e.g., Mayerson 1975); if the historicity of individual details may be questioned (Caner et al. 2010), the overall the fact of occasional tensions superimposed on typically stable and peaceful relations based on economic exchange and strategic balances seems clear (e.g., Avni 1996). Had hostile relations been the rule, then the proximity and overlap between settlement systems, not to mention the clear trade relations, would be inexplicable.

Beyond these rather static pictures of nomadic society and relations between the imperial periphery and the desert tribes, both historians and archaeologists have attempted to parse out historical trends and events using both the texts and the archaeology. Thus, Mayerson (1964) tied the Negev tribes directly to the Islamic conquests, suggesting that they offered the invading Muslim armies "insider" information on the region, acting as guides and scouts. Haiman (1995) has suggested that Umayyad villages of the Negev were populated by sedentarizing tribal groups, actively subsidized by the new Muslim

administration. Avni (2014:281–285) has also linked the rise of the aggregated villages of the Early Islamic period Negev to populations deriving from nomadic tribes, although not necessarily local tribes.

In the bigger view, the decline of the desert Byzantine towns cannot be attributed to the Muslim conquests (Avni 2014:281–285; Rosen 2000), but as an economic process clearly began in the late 6th century CE (Nahlieli 2007). Furthermore, the Persian Wars of the early 7th century, draining the resources of both the Sassanid and the Byzantine Empires, must also have severely impacted the desert periphery, reliant as it was on integration with the political core. In spite of stereotypes of nomadic raiding as a threat to the settled zone, it is telling that no historical records recount *major* raids (as opposed to the actual Muslim conquests themselves) into the Negev settled zone during this period, in spite of the obvious vulnerability of the periphery as a result of the declining fortunes of the center.

Archaeologically the following sequence is reasonably clear, if the precise chronologies are still disputed (e.g., Magness 2003). The desert towns show clear decline by the 7th century CE. this is evident, for example, in the abandonment of Avdat after destruction by the earthquake of 633 (Fabian 1996; Korjenkov and Mazor 1998).²¹ Other towns were undoubtedly also damaged, but show settlement continuity. By the 8th century CE a complex of aggregate villages based on run-off irrigation in tributary wadi systems developed in the higher areas around Sede Boker, and farther south (Haiman 1995; Nevo 1985, 1991). These are clearly associated with Early Islamic society, to judge by both the presence of mosques and an abundance of Arabic rock inscriptions in the immediate vicinity of these sites (Nevo et al. 1993; Sharon 1990). These villages²² are contemporary with the declining cities whose continued habitation is evident, for example, in the mosque at Shivta (Baly 1935), in Arabic texts in the archive from Nizzana (Kraemer 1958), and in coins, ceramics, and other fossil indices at other sites (e.g., Urman 2004:115–116). The pastoral system beyond the settled zone clearly continues well into the Early Islamic period, at least into the 8th century CE. and probably later. Recovered at Nahal Oded, a coin minted in Tiberias (Amitai-Preiss 1997) can be attributed to the reforms of Abdel el-Malik, as can the open-air mosques facing Mecca. The ceramics from these sites show strong typological continuity with the preceding periods, suggesting both economic continuities (as above, all the ceramics are imported) as well as the continuities inherent in typological and technological stability.²³

The date of the final abandonment of the cities, villages, and nomadic encampments in the Negev is debated, ranging anywhere from the early 8th through the 11th centuries CE (e.g., Magness 2003:133–169, 177–194). Historically the issue is important, reflecting the nature of the Early Islamic

state and its relationship to the periphery. In the Arava, there is clearly presence later in the range suggested above, as well as significant state investment in copper mining (e.g., Avner and Magness 1998) and agricultural systems (Nol 2015), presumably to support that mining. With respect to the rest of the Negev, the issue can only be resolved with systematic excavations.

With respect to the issues raised earlier concerning nomad-settled relations, the precise date of abandonment is perhaps less crucial. The nomadic system WAS abandoned, and no tribal presence is evident again in the central Negev until ca. 1700 CE. with the infiltration of the modern tribes into the region, roughly a 700-year gap and comparable to that of the 2nd millennium BCE. This should not be surprising. The number of nomadic sites attributable to the period of Late Antiquity is, in fact, greater than that of the 3rd millennium BCE. That is, if Timnian society exceeded some theoretical carrying capacity for autonomous nomads, then certainly the Saracens did as well. Thus, in the collapse of a sedentary infrastructure which could make up the difference between “carrying capacity” and nomadic population, the solution was to move elsewhere, perhaps settling down farther north, perhaps shifting either westwards or eastwards.

Notes

- 1 As indicated earlier, the Intermediate Bronze Age (Kochavi 1967) has also been referred to as the Early Bronze Age IV (e.g., Dever 1980), the Middle Bronze Age I (Albright 1949:80–82; Cohen 1999), and the Early Bronze—Middle Bronze (Kenyon 1980:120).
- 2 Two radiocarbon dates from the Atzmaut Rock shelter fall into the early-middle second millennium BCE (Rosen et al. 2005). However, newer dates from the same strata fall into the late 3rd millennium and accord better with the archaeological record (Rosen 2013).
- 3 Discussion of the historicity of the Bible is beyond the aegis of this work. However, there are nuances in the nature of biblical literalism as well. The creation myths are now the subject of historiographic research, rather than historic, even for scholars who tend to view the biblical account of later biblical events as more or less historical (e.g., Hoff-meier 2012).
- 4 Be'er Sheba, in Hebrew, means the Well of the Oath.
- 5 Wells are known from as early as the Neolithic (Galili and Nir 1993; Garfinkel et al. 2006), but only in areas much farther north.
- 6 The archaic use of the term *cattle* to refer to herds of sheep and goat, as well as *Bos* (small cattle as opposed to large cattle), has clearly caused confusion in the secondary literature.
- 7 Kitchen's (1964) claim that “practically no settled occupation between the nineteenth and tenth centuries B.C” is an example of this misapprehension since there is plenty of Middle Bronze and Late Bronze Age settlement in the northern Negev in this period.

- 8 The hypothetical claim that Stone Age peoples used stone tools and Bronze Age peoples did not, and therefore lithic scatters are evident in pre-Bronze Age times but would not be evident in later periods, is spurious. Chipped stone artifacts are abundant through the mid Iron Age (Rosen 1997).
- 9 *Hazerim*, from the Hebrew *hatzer*, implies enclosures or courtyards, a biblical reference (e.g., Deuteronomy 2:23) to a settlement type in the northern Negev in the early Iron Age.
- 10 The northern Negev (at least the western Northern Negev) shows no such clear long-term nadir and reference here is to areas farther south and more arid.
- 11 If the florescence of central Negev nomadism in the 3rd millennium BCE can in some way be tied to rise of exchange systems based on copper and other desert resources, beyond the import of tabular scrapers no candidates for explaining the abundance of sites in Jordan have been put forward. The question remains open. Perhaps pastoral products themselves were precious enough to export to the sedentary and urban civilization of the 3rd millennium BCE.
- 12 Claims that the four-room or pillared house, the typical Iron Age house both in the desert and the settled zone, reflect the replacement of tent poles by stone columns (e.g., Finkelstein 1984:238–239; Fritz 1981) ignore both the Late Bronze Age sedentary precedents for this architecture (Mazar 1992) and the fact that tents were not yet in common use among desert tribal groups in the Late Bronze Age (Rosen and Saidel 2010).
- 13 I have used the modern Hebrew names here with the ancient names in parentheses because this is how they have been published, for the most part. Note that we do not know the ancient name of Rehovot-ba-Negev, and Ruheiba is the local Arabic name for the ruins.
- 14 Since the publication of Rosen (2007) several more Negev survey monographs have been published, all from areas in the settled or urban zone of the Central Negev. Although several dozen additional Nabatean sites were documented in these surveys, none contained sites attributable to nomadic occupations. This all the more strengthens the patterns evident in the initial study.
- 15 Sites might be identified as Nabatean based on ceramic ware, but if these were not morphologically diagnostic, they were not illustrated. Hence, densities less than one sherd/site.
- 16 The dating of terraced fields is difficult. Although early investigators of Negev urbanism tended to attribute much of the agriculture to the Nabateans (e.g., Evenari et al. 1982:347; Negev 1983), re-evaluation of chronologies and settlement systems have reassigned all the massive agricultural systems to the later Byzantine and Early Islamic periods (Erickson-Gini 2012). On the other hand, the small-scale terraced fields in small wadi systems adjacent to Nabatean homesteads and hamlets probably reflect small scale agriculture.
- 17 Ephemeral sites like Givot Reved show very little sediment accumulation and are essentially in situ surface sites, similar in this respect to modern Bedouin campsites also present in the desert, and documented at Givot Reved as well. This is one of the problems of the archaeology of desert campsites; as a result, and as evident in many earlier sites as well, organic preservation is rare.
- 18 In fact, the general absence of artifacts in the contexts of such sites, and the simplicity of the sites themselves, renders dating a difficult challenge.

- 20 A small terraced field, less than the size of a football field, is located about 1.5 km southwest of the site of Nahal Oded. Another such small field is located on a terrace north of Har Oded, approximately 3.5 km away. These two fields contrast in both size and site proximity to the agricultural systems found north of the Makhtesh Ramon.
- 21 Notably, the site was rebuilt after the earthquake of 363 CE.
- 22 Nevo and Koren's (1990) claims that the village at Sede Boqer was not a village but a major cult center for evolving early Islam is based on fundamental misunderstandings of the archaeological record. Their claim that the pottery found at the site was broken into unreasonably small pieces and thus deliberately broken reflects lack of experience with other sites and the small size of many sherds (notably, the ceramic analysis is based exclusively on wares, and not ceramic types); their claim that the site had no functional floors and was built sloping reflects only that in the absence of flagstone, cobble, or plaster surfaces they dug through the earth floors to the bedrock hillslope (no stratigraphy is reported); his claim that the agricultural terraces were built to grow fodder and not to feed people ignores the actual need to feed people.
- 23 The problems of typological dating of ceramics, especially from survey, are severe. Haiman (1995) goes so far as to suggest that many of the sites attributed to the Byzantine period, both sedentary village sites and pastoral sites, should better be attributed to the Early Islamic period. However, there are enough indicators of the Early Islamic period at so many sites that with detailed study the periods can be distinguished and this general conclusion can be rejected.

Epilogue

An Archaeology of the End of Pastoral Nomadism

1700 and Beyond

Following the decline of the Classical Period Pastoral Complex in the Negev, there are no reliable historical references to nomads in the Central Negev until the late 18th and 19th centuries, with the early European explorations of the region. Turkish records make no reference to tribal groups in this region, although they do reference tribal groups in Jordan and other areas of Palestine ([e.g., Cohen 1973:79–80, 90–92, 151–152; Heyd 1960:69, 70; Hütteroth 1990]). This accords with the archaeology in the absence of sites reflecting pastoral tribal presence, but has not been the subject of any significant debate, an interesting contrast to the 2nd millennium BCE; presumably in the absence of powerful mythological texts, the need to explain archaeological absence is less pressing. Following the early-middle 2nd millennium CE gap (that is, ca. 1000–1700 CE. in the presence of habitation sites and camps (e.g. Fig. 11.1), the infiltration of the recent Bedouin tribes into the Negev can be dated to the late 17th/early 18th centuries CE. Radiocarbon dates from the tent camp at Be'erotayim, in the western Central Negev (Fig. 11.2; Saidel and Erickson-Gini 2014), indicate an occupation dated to that period and later. Additional radiocarbon dates from dung layers in various rock shelters (e.g., Fig. 7.2, Stratum I) in the Central Negev (Table 11.1) indicate stabling exploitation of these shelters in the absence of habitation camps in the period prior to 1700 CE, suggesting a new pattern of rather long-distance shepherding. By ca. 1700 CE. the increased number of dates in the rock shelters (17 of the 28 assays), and the increased depth of accumulation in this period, indicates significantly increased exploitation, presumably the result of the above-mentioned tribal infiltrations and occupation of the region. Israel (2006) dates the origins of Ottoman Gaza Ware pottery, the ubiquitous black, highly fired ware found in

virtually all recent Bedouin sites in

Table 11.1 1st millennium ce radiocarbon dates from rock shelters in the Central Negev. All dates come from dung layers, although some derive from different components of the dung.

<i>Lab #</i>	<i>Site</i>	<i>Uncalibrated Date bp</i>	<i>S.D</i>	<i>Calibrated interval 1 S.D.</i>	<i>Source material</i>	<i>depth cm/layer</i>	
1	IEMAE1318	Ashkarim	423	34	1437–1481 CE	-	25
2	IEMAE1330	Atzmaut	modern		post-1950 CE	plant remains from dung layer	20–23
3	IEMAE1331	Atzmaut	modern		post-1950 CE	plant remains from dung layer	17–20
4	RTK6340	Atzmaut	120	50	1685–1930 CE	cellulose	Stratum I
5	RTK6341–2	Atzmaut	135	50	1680–1940 CE	sediment WBA	Stratum I
6	IEMAE1348	Atzmaut	155	42	1669–1949 CE	solid dung layer	31–36
7	RTK6355	Atzmaut	160	50	1667–1950 CE	wood	Stratum I
8	RTK6341–3	Atzmaut	170	50	1665–1950 CE	dung pellet	Stratum I
9	IEMAE1329	Atzmaut	178	42	1662–1948 CE	plant remains from dung layer	30
10	IEMAE1355	Besor	2979	105	1371–1050 BC	plant remains from dung layer	74–124
11	IEMAE1357	Besor	modern		post-1950 CE	charcoal/ plant remains from dung layer	19–25
12	IEMAE1317	Loz	203	62	1641–1949 CE	plant remains from dung layer	40–46
13	IEMAE1341	Loz	233	91	1518–1949 CE	plant remains, fr. 5–2 mm	46–52
14	IEMAE1343	Loz	447	34	1429–1467 CE	plant remains, fr. 5–2 mm	52–58

15	IEMAE1322	Neqarot	modern		post-1950 CE	plant remains from dung layer	45
16	IEMAE1345	Neqarot	modern		post-1950 CE	dung	4-7
17	IEMAE1349	Neqarot	modern		post-1950 CE	dung	11-14
18	IEMAE1321	Neqarot	743	30	1261-1290 CE	-	26-27
19	IEMAE1333	Neqarot	891	92	1038-1217 CE	dung, fr. > 1 mm	32-35
20	IEMAE1351	Neqarot	1004	44	984-1152 CE	dung	0-2
21	IEMAE1344	Neqarot	1058	44	903-1020 CE	dung	under boulder'
22	RTT5726	Ramon I	post-bomb		post-1950 CE	dung	Stratum Ia
23	RTT5727	Ramon I	150	55	1660-1950 CE	dung	Stratum Ib
24	IEMAE1346	Zalzal	modern		post-1950 CE	dung	15.5-18.5
25	IEMAE1347	Zalzal	502	38	1408-1438 CE	plant remains, fr. 5-2 mm	54-59
26	IEMAE1350	Zalzal	592	32	1309-1402 CE	plant remains, fr. 5-2 mm	59-63
27	IEMAE1353	Zalzal	740	48	1225-1297 CE	charcoal, Fr. > 5 mm	77-80
28	IEMAE1354	Zalzal	856	80	1045-1260 CE	plant remains, fr. 5-2 mm	106-110

the Negev (e.g., Rosen and Avni 1997:70, fig. 7.6), to ca. 1700 CE. a date supported by dates on snail shells found in association with Gaza Ware sherds in the upper stratum of alluvial sections in the Negev (Rosen and Goodfriend 1993). Finally, based on the oral histories of Bedouin tribes in the region, Bailey (1980, 1985) has suggested a date of ca. 1800 CE for the arrival of these tribes to the northern and central Negev, although the current tribes present in Sinai seem to have arrived much earlier. These oral histories reflect migration into an unoccupied area.

Thus, when the earliest European explorers, adventurers like Seetzen (1810) and Burkhardt (1968 [1829]), began infiltrating the Negev and surrounding regions in

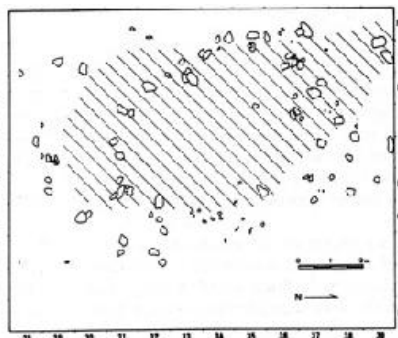


Figure 11.1 Recent Bedouin tent camp, near the Nabatean site of Givot Reved, in the *Makhtesh Ramon* (Rosen 1993).

Source: Photo S. Rosen.

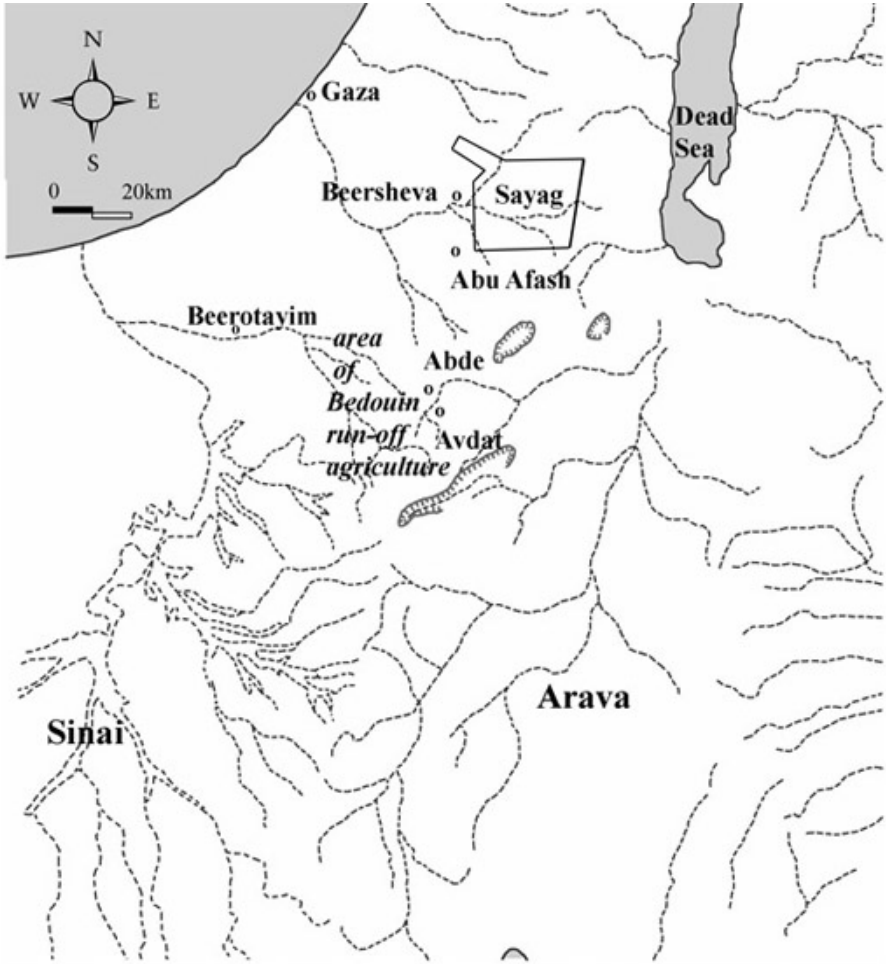


Figure 11.2 Map of sites mentioned in chapter. Area of Bedouin agriculture after Kirk (1941).

the early 19th century, the modern Bedouin tribes had been established in the region for a century or longer. They immediately became a subject of interest, curiosity, romance, and scholarly endeavor. Beginning with travelers', missionaries', and explorers' accounts and through those of soldiers, administrators and scholars, Bedouin society in the Near East, and in the Levant in particular, became the subject of a huge literature in the 19th, 20th, and 21st centuries. If the underpinnings of much of this literature are fundamentally Orientalist (cf. Said 1978), especially in the early stages of depiction and description, the wealth of description is undeniable. If one can

cull out the romance, the biblical preconceptions, the perceptions of Bedouin as noble savage, the ideas of cultural evolution, etc., the descriptions offer a large store of information from which a rich picture of Bedouin society and culture can be drawn. Depictions of material culture, obviously a major focus of archaeological research, are especially common; for example, the Bedouin tent (black tent, *beit sa'ir*, etc.), in its material aspects as well as spatial organization, has been described numerous times (e.g., Cole 1975:64–65; Jabbur 1995:242–243; Musil 1928:61–72). The political history of the Bedouin in the region has also been the subject of inquiry, especially by the late 20th century, so that shifting boundaries of Bedouin tribes (el Aref 1934; for Syria see Lewis 1987) and relations with the various states in the region on different scales from the tribal to the household have been described. Subsistence practices have also been described, and transitions to agriculture, sedentarization, and seasonal rounds have been reviewed. It is far beyond the scope of this work to offer any kind of review of Bedouin cultural and society, but archaeology as a discipline still has insights to offer.

An Archaeology of Recent Bedouin

Bedouin sites, attributable to these past 200–300 years based on the presence of Gaza Ware, are ubiquitous throughout the Negev (*per contra* Finkelstein and Perevoletsky 1990). They comprise a range of site types, including ephemeral camps, tent camps (Fig. 11.1), ceramic scatters, archaeological sites such as terrace dams systems showing repair and re-use (Fig. 11.2, storage bins in rock shelters (*matmurot*) (Fig. 11.3), cemeteries, stabling rock shelters (Fig. 7.2), small isolated features like hearths, stone piles and markers, open air mosques, and rock art sites (datable by reference to known tribal symbols, *wusum* [Eisenberg-Degen 2012:235–237]). Although a number of these sites have been investigated in the contexts of ethno-archaeological studies as background to ancient nomadic cultures (e.g., in the Negev, Avni 1992; Eldar et al. 1992; in Jordan, Banning and Rollefson 1986, 1992; Simms 1988; in Sinai, Goren-Inbar 1993; Kozloff 1981), little systematic research has been conducted on Bedouin remains which truly integrates those remains in a larger picture of Bedouin society in the Ottoman Period. Thus, for example, no one has compiled large-scale site distribution maps of Bedouin remains which can be compared to those of ancient times.

Several exceptions are notable. Saidel's (2008a,b, 2009a,b; Saidel and Erickson-gini 2014) work in both the Negev and Jordan, on both Bedouin sites

and material culture, places recent Bedouin society firmly in its modern historical, economic, and political contexts, strongly contesting the idea that Bedouin society is somehow ancient or fossilized (especially Saidel 2008a). Thus, for example, his work on the use of ceramic and stone tobacco pipes among Bedouin populations in the Negev and Sinai (Saidel 2008b, 2009a) demonstrates the adoption of tobacco, and its adaptation to Bedouin society. Both the tobacco and the pipes themselves reflect economic linkages with the Ottoman Empire, and of course to the world beyond that. His studies of the Bedouin tent show it to be a “modern” phenomenon, one adapted to the dynamics of Bedouin society in its internal organization, mobility systems, and raw materials.



Figure 11.3 Bedouin storage bins in rock shelter near the Makhtesh Ramon. *Source:* Photo S. Rosen

Working in the Central Negev at the Bedouin settlement of Abde (Fig. 11.1), opposite the ancient Byzantine town of Avdat, Meraiot (2011, 2013) has analyzed both the geographic structure of recent Bedouin settlements and the material patterns of sedentarization, tracing geographic anchors, functional features (tents, cisterns, terraced fields, etc.), and territorial markers in their evolution from the nomadism of the mid-19th century through the adoption of systematic agriculture and sedentarization of the early-middle 20th century, and on to recent recolonization (in many cases resisting pressures to settle in state-sanctioned towns) in the region following the peace agreement with

Egypt and the general stabilization of the Negev in terms of security. Meraiot (2011, 2013:101–108) has offered a different view of Bedouin territoriality, defining central features in the cultural landscape of the Abde settlement, focusing on sedentarization processes and how a specific set of site attributes, the tent/home, the agricultural plots, cisterns, silos, rock shelters, storage structures, cemeteries, and water sources were each integrated into a dynamic settlement system which was transforming from public to private functions. The modification, repair, and re-use of ancient agricultural terrace fields (Fig. 11.4) and ancient cisterns by recent Bedouin, and the incorporation of these ancient features into their local myths and cultural landscape is an important feature of Bedouin settlement, adding a layer of meaning to the landscape which is not accessible for most archaeological periods. Meraiot traces the transition from nomad to farmer among the Azazmeh Bedouin from the 19th through early 21st centuries, showing how landscape features such as springs, fields, and cemeteries change in conceptual importance as territorial paradigms shift from more corporate to more private, concomitant with the shift from the primacy of pastoralism and mobility to farming and sedentism.



Figure 11.4 Ancient agricultural terraces near the *Makhtesh Ramon* showing Bedouin repair in the uppermost course. The absence of fill behind the upper course, the different style of construction (use of irregular upright slabs, haphazardly placed one against the other), and the absence of silt between the stone all contrast with Byzantine dam systems and indicate recent construction.

Unlike earlier cycles of sedentarization and nomadization, this transformation seems to be a fundamental change of state (Meir 1996, 1997). Historically, the sedentarization of the Negev Bedouin can be traced back to Turkish efforts to better integrate the tribes into the Ottoman state with the establishment of farming villages in the western Negev in the late 19th

century, and especially in the founding of modern Beersheva in the early 20th century. To a great extent Turkish rule stabilized relations between the tribes, establishing borders between tribes and ending the period of internecine warfare of the mid 19th century. By the 1920s and 1930s, during the period of the British mandate, systematic agriculture was the rule as far south as the Central Negev (Fig. 11.2; e.g., Epstein 1939; Kirk 1941). Archaeologically this is evident in the repair and modification of Classical period run-off irrigation agricultural terraces (Fig. 11.4) throughout the entire expanse of the Central Negev.

The political perturbations that accompanied the rise and development of the State of Israel severely impacted Bedouin communities in the Negev. In the 1950s most were forcibly resettled in the *sayaj*, essentially a reservation in the northeastern Negev (Fig. 11.2; Marx 1967:6, 13–14, map 1), the rationale being “security”. Much of the Central Negev became a closed military zone. Those Bedouin of the Central Negev who did not settle in the reservation retreated into the recesses of the higher hills, away from settlements and thoroughfares (Meraïot 2011:125–128), a circumstance that continued until the 1967 war, the conquest of Sinai, and the opening up of the Negev resulting from the deployment of the Israel Defense Forces to Sinai. By the 1980s, Bedouin were resettling those areas of the Central Negev abandoned as a result of the military expulsions of the 1950s, a movement which continued to develop in the 1990s and 2000s. As farming in the early 20th century became more important to Bedouin economy, the patterns of nomadism and pastoralism also changed. If in the Northern Negev much of the farming was actually conducted by client groups (Marx 1967:75–77, 91–94), so that to a great extent Bedouin were free to continue an annual pastoral round with their sheep and goats, in the Central Negev, perhaps as a consequence of lesser wealth afforded by the poorer agricultural land, the Bedouin themselves farmed (Meraïot 2013:101–108) and among those farmers (if perhaps not among all the Bedouin of the region), the economic role of pastoralism declined. Sedentism increased in tandem, evident architecturally, for example, in the poured concrete floors of the black tents in the Abde village. Of course, the fact that many of the Bedouin continue to live in modified tents in spite of their sedentism reflects the transitional state of the architecture.

By the 2000s, The Bedouin population of the Negev approached 200,000. Some 50% of these people live in urbanized settlements in the Northern Negev built by the state as part of its ad hoc programs (in light of the fact that they are constantly changing) to sedentize the tribes. Most of the remaining population lives in unrecognized villages (Fig. 11.5) located throughout the Northern and Central Negev, spontaneously founded as populations grew and expanded beyond *sayaj*. While to a degree pastoral, these settlements are not

nomadic.

Pastoral nomadic sedentarization and the transition to farming, and the converse return to nomadism, have occurred at different scales and different times in the long-term history of the Near East (e.g., Adams 1978). However, there are good reasons to conclude that this current transition to urbanism and, to a lesser extent, farming, marks the end of this cyclical system. In the past, after the initial development of nomadic systems whose integration with the settled zone allowed populations to exceed pastoral carrying capacities, with the collapse of settled zone infrastructure, those populations were not so large so as not to be able to disperse over a wider expanse, or integrate even more into the sedentary system, leaving a core of desert pastoralists, perhaps in a contracted area, to continue to live mobile lives. The Bedouin population of the Negev today is orders of magnitude greater than it ever was during the nomadic past, and there is no essential core of people who still practice a traditional seasonal round. Indeed, the lands needed for the seasonal round are no longer available. The integration of the Bedouin into the modern Israeli economy is deep and all encompassing, as much as they occupy positions low in the socio-economic hierarchy. It is not clear at all whether the requisite knowledge for any return to seasonal pastoral mobility is available to any sizeable population of young people. It is not clear that the changing social structures and ideologies of Bedouin society would even offer this as a conceptual option.



Figure 11.5 The unrecognized village of Abu Afash, on the main highway (40), south of Beersheva (Google Earth).

Note: Location of village in [Figure 11.1](#).

Beyond the Bedouin themselves, the expansion of the state into the marginal zones renders any systematic form of mobile pastoralism virtually impossible.

Between the international borders restricting movement which was not restricted 100 years ago, the presence of the military in areas previously open (especially in light of the redeployment of the Israel Defense Forces out of Sinai after the peace agreement with Egypt), the creation of major nature preserves covering large areas in which intensive grazing is prohibited, the creation of boutique vineyards and farms for winter crops (this especially in the Arava) based on water piped in from farther north, and the creation of a modern road network allowing easy access to areas previously inaccessible to any but the nomads, there is no longer a geography appropriate for a nomadic round.

The small size of the Negev, and of Israel in general, amplifies the ever-increasing constraints on any potential nomadic system. However, the same trends are evident throughout the Near East as modern states expand intensively into marginal areas and create markets which co-opt marginal populations out of traditional economies.

After the Revolutions

Pastoral nomadism is the stuff of the *longue durée*. There is no single diagnostic element, prototypical culture, nor defining threshold for this phenomenon. Rather it should be seen as cumulative effect, a process, developing over millennia, an order, rather than a genus or a species, to adopt a biological metaphor; a lineage, or set of lineages, to adopt an anthropological one. The review of the southern Levantine systems presented here is but a single example of the great diversity inherent over this long developmental or evolutionary span.

Several themes need to be reiterated. The first is that field archaeology is the only means of significantly expanding our understanding of the origins, development, and history of this phenomenon we call pastoral nomadism. This is not to say that it takes precedence over any other form of evidence, but that unlike historical/textual analyses and ethnographic study, field archaeology, both survey and excavation, as a source of data is still virtually untapped. If perhaps there are regions or periods where pastoralists are poorly preserved in the archaeological record, the archaeology of mobile pastoralists has been conducted on every continent where animals have been herded. If we accepted the arguments of invisible nomads, then we would have given up long ago on the archaeology of hunter-gatherers as well. Invisibility is an illusion.

Furthermore, to follow up on Chang and Koster's (1986) open call, the

archaeology of pastoral societies goes way beyond bones. If faunal assemblages are crucial for understanding the pastoral aspects of these societies, everything we learn from ethnography says that these societies are far richer than only the animal bones and, in fact, cannot be understood by reference to the bones alone. Indeed, given the problems of preservation in open-air camp sites, we need to ask about the special circumstances in which bone assemblages preserve. Most sites can be expected to preserve ceramics, stone tools, beads, etc. even if the bones are not there. These sites too offer great potentials for understanding mobile pastoral societies, even if in such cases we cannot quite get at the pastoral part.

Archaeology also offers us the study of the nomads themselves and not just the reflections of nomads in other aspects of the archaeological or historical record. If the existence of the outer planets of the solar system was originally deduced by their gravitational effects on closer planets, astronomers then found those planets (sometimes demoting them to planetoid status). It is not enough to see the impact of nomads on trade, to adduce their presence from iconography, or to attribute mass destruction to their (almost always mythical) depredations.

Archaeology also doubles the effective chronological scope of the phenomenon which we loosely call pastoral nomadism, extending it well into prehistoric times. Smail (2007) rails against the chronological limitations of written history as a discipline, attributing them to the residual effects of biblical chronologies. Archaeologists have no such constraints, the discipline extending back to deep prehistory. Yet, we seem constrained by the historical structure of our discipline, and worse, our preconceptions of nomads as Bedouin, and Bedouin as fossils. Unlike the fictional gene splicing in *Jurassic Park*, where missing segments of reconstructed dinosaur genes were filled in with those of living animals (of course, ending in disaster), modern Bedouin societies cannot be used to fill in the blanks in our reconstructions of ancient nomadic societies. If this seems to be the beating of the proverbial dead horse, then the horse seems to have nine lives, constantly resurrected in the comparison of modern Bedouin to ancient peoples. There are no longer any insights to be gained there, or rather we have long passed the point of diminishing returns in those comparisons.

If the adoption of herd animals into peripheral hunter-gatherer societies is viewed as the adoption of a technical innovation, then the long development, the fine-tuning of that innovation, led to new structures and new innovations. The dialectic is clear, although as always, our definitions of what really constitute the theses, antitheses, and syntheses are hardly objective. In this sense, the revolutions of desert pastoral systems, ecological adaptations which include the social as well as the physical and biological ecologies, are

comparable to the revolutions of other technical systems with great impacts on society; obvious examples are the agricultural revolution, the industrial revolution, and the digital revolution. These are, of course, revolutions in the sense of deep and lasting impact on society, rather than necessarily being the rapid overthrow of a previously existing system.

For such revolutions, after a time their impact is subsumed conceptually under the succeeding revolution. Thus, the urban revolution, building on its agricultural predecessor, also integrates it; thus the digital revolution subsumes the industrial. Thus also the revolutions comprising the rise and development of pastoral nomadic societies are co-opted one by other; from another perspective, they are co-opted as well by the larger-scale evolutions and revolutions in the ever-changing human career.

References

- Abadi, Y. and Rosen, S.A. 2008. A Chip Off the Old Millstone. Pp. 99–115 in *New Approaches to Old Stones: Recent Studies of Groundstone Artifacts*. Rowan, Y. and Ebeling, J. (eds.). Equinox, London.
- Abadi-Reiss, Y. 2009. *The Site of Qatif Y3 and the Neolithic-Chalcolithic Transition in the Southern Levant*. Unpublished doctoral dissertation, Ben-Gurion University of the Negev, Beersheva.
- Abadi-Reiss, Y. and Saidel, B. 2014. The Ground Stone Assemblage. Pp. 220–229 in *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. Saidel, B. and Haiman, M. (eds.). BAR International Series 2684, Archaeopress, Oxford.
- Abe, M. 2008. *The Development of Urbanism and Pastoral Nomads in the Southern Levant—Chalcolithic and Early Bronze Age Stone Tool Production Industries and Flint Mines in the Jafr Basin, Southern Jordan*. Unpublished doctoral dissertation, University of Liverpool, Liverpool.
- Abu-Azizeh, W. 2010. *Occupation et mise en valeur des périphéries désertiques du Proche-Orient au Chalcolithique/Bronze ancien: Le cas de la région de al-Thulaythuwaat dans le sud de la Jordanie*. Unpublished doctoral dissertation, l'Université de Saint-Quentin-en-Yvelines, Paris.
- Abu-Azizeh, W. 2013. The South-Eastern Jordan's Chalcolithic—Early Bronze Age Pastoral Nomadic Complex: Patterns of Mobility and Interaction. *Paléorient* 39: 149–176.
- Abu-Azizeh, W. 2014. Stone Enclosures and Late Prehistoric Pastoral Nomadic Campsites: A Methodological Review of al-Thulaythuwaat Case Study, Southern Jordan. Pp. 187–207 in *Settlement, Survey and Stone: Essays on Near Eastern Prehistory in Honour of Gary Rollefson*. Finlayson, B. and Makarewicz, C. (eds.). Ex Oriente and the Council for British Research in the Levant, Berlin and London.
- Abu-Azizeh, W., Tarawneh, M., Abudanah, F., Twaissi, S., and Al-Salameen, A. 2014. Variability within Consistency: Cairns and Funerary Practices of the Late Neolithic/Early Chalcolithic in the Al-Thulaythuwaat Area, Southern Jordan. *Levant* 46: 161–185.
- Abu El-Haj, N. 2001. *Facts on the Ground: Archaeological Practice and Territorial Self-Fashioning in Israeli Society*. University of Chicago Press,

Chicago.

- Adams, R.B. 2002. From Farms to Factories: The Development of Copper Production at Faynan, Southern Jordan, during the Early Bronze Age. Pp. 21–32 in *Metals and Society*. Ottaway, B.S. and Wager, E.C. (eds.). Archaeopress 1061, Oxford.
- Adams, R.B. and Genz, H. 1995. Excavations at Wadi Fidan 4: A Chalcolithic Village Complex in the Copper Ore District of Feinan, Southern Jordan. *Palestine Exploration Quarterly* 127: 8–20.
- Adams, R.M. 1978. Strategies of Maximization, Stability, and Resilience in Mesopotamian Society, Settlement, and Agriculture. *Proceedings of the American Philosophical Society* 122: 329–335.
- Aharoni, Y. 1967. *The Land of the Bible: A Historical Geography*. Westminster, Louisville.
- Aharoni, Y. and Naveh, J. 1981. *Arad Inscriptions*. Israel Exploration Society, Jerusalem.
- Ahituv, S. 1984. *Canaanite Toponyms in Ancient Egyptian Documents*. Magnes and Brill, Jerusalem and Leiden.
- Albert, R.M. and Henry, D.O. 2004. Herding and Agricultural Activities at the Early Neolithic Site of Ayn Abu Nukhayla (Wadi Rum, Jordan): The Results of Phytolith and Spherulite Analyses. *Paléorient* 30: 81–92.
- Albright, W.F. 1949. *The Archaeology of Palestine*. Pelican, London.
- Algaze, G. 2005 [1993]. *The Uruk World System: The Dynamics of Expansion of Early Mesopotamian Civilization*. University of Chicago, Chicago.
- Algaze, G. 2008. *Ancient Mesopotamia at the Dawn of Civilization: The Evolution of an Urban Landscape*. University of Chicago, Chicago.
- Alizadeh, A. 2008. Archaeology and the Question of Mobile Pastoralism in Late Prehistory. Pp. 88–114 in *The Archaeology of Mobility*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Alizadeh, A. 2010. The Rise of the Highland Elamite State in Southwestern Iran. *Current Anthropology* 51: 353–383.
- Ambrose, S.H. and DeNiro, M.J. 1986. Reconstruction of African Human Diet Using Bone Collagen Carbon and Nitrogen Isotope Ratios. *Nature* 319: 321–324.
- Amiran, R. 1969. *Ancient Pottery of the Holy Land*. Massada Press, Tel Aviv.
- Amiran, R. 1986. The fall of the Early Bronze age II city of Arad. *Israel Exploration Journal* 36: 74–76.
- Amiran, R., Beit Arie, I., and Glass, J. 1973. The Interrelationship between Arad and Sites in the Southern Sinai in the Early Bronze II. *Israel Exploration Journal* 23: 33–38.
- Amiran, R., Ilan, O., Saban, M., and Herzog, Z. 1997. *Ancient Arad, an Early Bronze Age Community on the Desert Fringe*. HaKibbutz HaMeuhad, the

- Israel Exploration Society and the Israel Antiquities Authority, Jerusalem. (Hebrew).
- Amiran, R., Paran, U., Shiloh, Y., Tsafrir, Y., Brown, R., and Ben-Tor, A. 1978. *Early Arad: The Chalcolithic Settlement and Early Bronze City; First-Fifth Seasons of Excavations, 1962–1966*. Israel Exploration Society, Jerusalem.
- Amitai-Preiss, N. 1997. Appendix Four: A Bronze Coin from the Ummayyid Period. Pp. 128–129 in *The Oded Sites: Investigations of Two Early Islamic Pastoral Camps South of the Ramon Crater*. Rosen, S.A. and Avni, G. (eds.). Beersheva XI, Ben-Gurion University Press, Beersheva.
- Anati, E. 1986. *The Mountain of God: Har Karkom*. Rizzoli, New York.
- Anati, E. 2013. *Is Har Karkom the Biblical Mount Sinai?* Atelier, Capo di Ponte, Italy.
- Anati, E. 2015. *The Rock Art of the Negev and Sinai*. Atelier, Capo di Ponte, Italy.
- Anderson, P., Chabot, J., and van Gijn, A. 2004. The Functional Riddle of ‘Glossy’ Canaanean Blades and the Near Eastern Threshing Sledge. *Journal of Mediterranean Archaeology* 17: 87–130.
- Anderson, P.C., Georges, J.M., Vargiolu, P., and Zahouani, H. 2006. Insights from a Tribological Analysis of the Tribulum. *Journal of Archaeological Science* 33: 1559–1568.
- Anfinset, N. 2010. *Metals, Nomads and Culture Contact, the Middle East and North Africa*. Equinox, London.
- Anthony, D.W. and Brown, D.R. 1991. The Origins of Horseback Riding. *Antiquity* 246: 22–38.
- Arbuckle, B.S. 2014. Pace and Process in the Emergence of Animal Husbandry in Neolithic Southwest Asia. *Bioarchaeology of the Near East* 8: 53–81.
- Arnold, E.R. and Greenfield, H.J. 2006. *The Origins of Transhumant Pastoralism in Temperate Southeastern Europe: A Zooarchaeological Perspective from the Central Balkans*. British Archaeological Reports International 1538, Oxford.
- Arubas, B. and Goldfus, H. 2008. Elusa. Pp. 1713–1715 in *The New Encyclopedia of Archaeology in the Holy Land*, Vol. 5. Stern, E. (ed.). Israel Exploration Society, Jerusalem.
- Ascher, R. 1961. Analogy in Archaeological Interpretation. *Southwest Journal of Anthropology* 17: 317–325.
- Asouti, E. 2006. Beyond the Pre-Pottery Neolithic B Interaction Sphere. *Journal of World Prehistory* 20: 87–126.
- Asscher, Y., Lehmann, G., Rosen, S.A., Weiner, S., and Boaretto, E. 2015. Absolute Dating of the Late Bronze to Iron Age Transition and the Appearance of Philistine Culture in Qubur el-Walaydah, Southern Levant. *Radiocarbon* 57: 1–21.

- Astour, M. 1979. Yahweh in Egyptian Topographical Lists. *Agypten und Altes Testament* 12: 17–33.
- Astour, M.C. 1989. Review of Ahituv, S. *Canaanite Toponyms in Ancient Egyptian Documents*. *Journal of Near Eastern Studies* 48: 35–38.
- Avner, U. 1984. Ancient Cult Sites in the Negev and Sinai Deserts. *Tel Aviv* 11: 115–131.
- Avner, U. 1990. Ancient Agricultural Settlement and Religion in the Uvda Valley in Southern Israel. *Biblical Archaeologist* 53: 125–141.
- Avner, U. 1998. Settlement, Agriculture, and Paleoclimate in Uvda Valley, Southern Negev Desert, 6th–3rd Millennia BC. Pp. 147–202 in *Water, Environment, and Society in Times of Climatic Change*. Issar, I. and Brown, N. (eds.). Kluwer, Dordrecht.
- Avner, U. 1999–2000. Nabataean Standing Stones and Their Interpretation. *Aram* 11: 97–122.
- Avner, U. 2002. *Studies in the Material and Spiritual Culture of the Negev and Sinai Populations, during the 6th–3rd Millennia B.C.* Unpublished doctoral dissertation, Hebrew University, Jerusalem.
- Avner, U. 2007. Bedouin Cultural Remains in the Eilat Region. Pp. 25–36 in *On the Fringe of Society: Archaeological and Ethnoarchaeological Perspectives on Pastoral and Agricultural Societies*. Saidel, B.A. and van der Steen, E.J. (eds.). British Archaeological Reports International 1657, Oxford.
- Avner, U. and Carmi, I. 2001. Settlement Patterns in the Southern Levant Deserts during the 6th–3rd Millennia BC: A Revision Based on ¹⁴C Dating. *Radiocarbon* 43: 1203–1216.
- Avner, U., Carmi, I., and Segal, D. 1994. Neolithic to Bronze Age Settlement of the Negev and Sinai in Light of Radiocarbon Dating: A View from the Southern Negev. Pp. 265–300 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). Radiocarbon, Tucson.
- Avner, U. and Magness, J. 1998. Early Islamic Settlement in the Southern Negev. *Bulletin of the American Schools of Oriental Research* 210: 39–57.
- Avner, U., Shalmon, B., Hadas, G., Porat, N., and Horwitz, L.K. 2011. Carnivore Traps in the Negev and Judean Deserts (Israel): Function, Location and Chronology. Pp. 253–268 in *Predateurs dans tous leurs 'etats'. Evolution, Biodiversité, Interactions, Mythes, Symbols*. Brugal, J.P., Gardeisen, A., and Zucker, A. (eds.). Association pour la promotion et la diffusion des connaissances archéologiques, Antibes.
- Avner, U., Shem-Tov, M., Enmar, L., Ragolski, G., Shem-Tov, R., and Barzilai, O. 2014. Survey of Neolithic Cult Sites in the Eilat Mountains, Israel. *Journal of the Israel Prehistoric Society* 44: 101–116.
- Avni, G. 1992. Survey of Deserted Bedouin Campsites in the Negev Highlands

- and Its Implications for Archaeological Research. Pp. 241–254 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Avni, G. 1994. Early Mosques in the Negev Highlands: New Archaeological Evidence on Islamic Penetration of Southern Palestine. *Bulletin of the American Schools of Oriental Research* 294: 83–100.
- Avni, G. 1996. *Nomads, Farmers, and Town-Dwellers: Pastoralist-Sedentist Interaction in the Negev Highlands, Sixth-Eighth Centuries C.E.* Israel Antiquities Authority, Jerusalem.
- Avni, G. 2014. *The Byzantine-Islamic Transition in Palestine: An Archaeological Approach*. Oxford University Press, Oxford.
- Avni, Y., Porat, N., and Avni, G. 2012. Pre-Farming Environment and OSL Chronology in the Negev Highlands, Israel. *Journal of Arid Environments* 86: 12–27.
- Babenki, A.N. and Khassanov, B.F. 2007. The Absolute Chronology of the Zoogenic Deposits from the Negev Desert (Israel). *Geochronometria* 28: 47–53.
- Babenki, A.N., Kiseleva, N.K., Plakht, I., Rosen, S., Savinetskii, A.B., and Khassanov, B.F. 2007. Reconstruction of the Holocene Vegetation in the Central Negev Desert, Israel, on the Basis of Palynological Data on the Atzmaut Zoogenic Deposit. *Russian Journal of Ecology* 38(6): 388–397.
- Bacon, E. 1954. Types of Pastoral Nomadism in Central and Southwest Asia. *Southwestern Journal of Anthropology* 10: 44–68.
- Bailey, C. 1980. The Negev in the 19th Century: Reconstructing History from Bedouin Oral Traditions. *Asian and African Studies* 14: 35–80.
- Bailey, C. 1985. Dating the Arrival of the Bedouin Tribes in Sinai and the Negev. *Journal of the Economic and Social History of the Orient* 28: 20–49.
- Bailey, C. and Danin, A. 1981. Bedouin Plant Utilization in Sinai and the Negev. *Economic Botany* 35: 145–162.
- Bailey, C. and Shmueli, A. 1977. The Settlement of the Sinaitic Ayaydah in the Suez Canal Zone. *Palestine Exploration Quarterly* 109: 27–38.
- Baird, D. 1994. The Chipped Stone: Pp. 85–91 in Garrard et al., Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1987 and 1988 Excavation Seasons. *Levant* 26: 73–109.
- Baird, D., Garrard, A., Martin, L., and Wright, K. 1992. Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1989 Excavation Season. *Levant* 24: 1–31.
- Bakhit, A.M. 1982. *The Ottoman Province of Damascus in the Sixteenth Century*. Librarie Du Liban, Beirut.
- Baly, C. 1935. Sbaita. *Palestine Exploration Quarterly* 62: 171–181.

- Banning, E.B. 1986. Peasants, Pastoralists, and *Pax Romana*: Mutualism in the Southern Highlands of Jordan. *Bulletin of the American Schools of Oriental Research* 261: 25–50.
- Banning, E.B. 2011. So Fair a House. *Current Anthropology* 52: 619–660.
- Banning, E.B. and Köhler-Rollefson, I. 1986. Ethnoarchaeological Survey in the Beda Area, Southern Jordan. *Zeitschrift des Deutschen Palaestina-vereins* 102: 152–170.
- Banning, E.B. and Köhler-Rollefson, I. 1992. Ethnographic Lessons for the Pastoral Past: Camp Locations and Material Remains near Beidha, Southern Jordan. Pp. 181–204 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10. Prehistory Press, Madison.
- Bar, S., Cohen, O., and Zertal, A. 2013. New Aspects of the Intermediate Bronze Age (Ib/Mbi/Ebiv): Khirbet El-Meiyiteh—a Fortified Site on the Eastern Fringe of Samaria. *Revue Biblique* 120: 161–181.
- Bar-Adon, P. 1989. Mizpe Shalem. Pp. 50–60 in *Excavations in the Judean Desert*. BarAdon, P. (ed.). Atiqot 9.
- Barfield, L. 2003. Archaeology as Anthropology of the Long Term. Pp. 41–49 in Gillespie, S.D., Nichols, D.L., and Anderson, D.G. (eds.). *Archaeology Is Anthropology*. Archeological Papers of the American Anthropological Association 13, American Anthropological Association, Arlington.
- Barfield, T. 1981. *The Central Asian Arabs of Afghanistan: Pastoral Nomadism in Transition*. University of Texas Press, Austin.
- Barkai, R. and Liran, R. 2008. Midsummer Sunset at Neolithic Jericho. *Time and Mind* 1: 273–283.
- Barkai, R. and Yerkes, R.W. 2008. Stone Axes as Cultural Markers: Technological, Functional and Symbolic Changes in Bifacial Tools during the Transition from Hunter-Gatherers to Sedentary Agriculturalists in the Southern Levant. *Prehistoric Technology* 40: 159–167.
- Barket, T.M. and Bell, C.A. 2011. Tabular Scrapers: Function Revisited. *Near Eastern Archaeology* 74: 56–59.
- Bar-Matthews, M. and Ayalon, A. 2004. Speleothems as Palaeoclimate Indicators, a Case Study from Soreq Cave Located in the Eastern Mediterranean Region, Israel. Pp. 363–391 in *Past Climate Variability through Europe and Africa*. Battarbee, R.W., Gasse, F., and Stickley, C.E. (eds.). Kluwer, Dordrecht.
- Bar-Matthews, M. and Ayalon, A. 2011. Mid-Holocene Climate Variations Revealed by High-Resolution Speleothem Records from Soreq Cave, Israel and Their Correlation with Cultural Changes. *The Holocene* 21: 163–171.
- Bar-Matthews, M., Ayalon, A., and Kaufman, A. 1998. Middle to Late Holocene

- (6500 Years Period) Paleoclimate in the Eastern Mediterranean Region from Stable Isotope Composition of Speleothems from Soreq Cave, Israel. Pp. 203–224 in *Water, Environment, and Society in Times of Climatic Change*. Issar, I. and Brown, N. (eds.). Kluwer, Dordrecht.
- Bar-Matthews, M., Ayalon, A., Kaufman, A., and Wasserburg, G.J. 1999. The Eastern Mediterranean Paleoclimate as a Reflection of Regional Events. *Earth and Planetary Science Letters* 166: 85–95.
- Barnard, H. and Wendrich, W. (eds.). 2008. The Archaeology of Mobility: Old World and New World Nomadism. Cotsen Advanced Seminar Series 4, Cotsen Institute of Archaeology, Los Angeles.
- Barnett, R.D. 1976. *Sculptures from the North Palace at Nineveh (668–627 B.C.)*. British Museum, London.
- Bar-Oz, G., Nadel, D., Avner, U., and Malkinson, D. 2011a. Mass Hunting Game Traps in the Southern Levant: The Negev and Arabah ‘Desert Kites’. *Near Eastern Archaeology* 74: 208–215.
- Bar-Oz, G., Zeder, M., and Hole, F. 2011b. Role of Mass-Kill Hunting Strategies in the Extirpation of Persian Gazelle (*Gazella subgutturosa*) in the Northern Levant. *Proceedings of the National Academy of Science* 108: 7345–7350.
- Barth, F. 1961. *Nomads of South Persia*. Little Brown, Boston.
- Barth, F. 1964. Capital, Investment, and the Social Structure of a Pastoral Nomad Group in South Persia. Pp. 244–256 in *Anthropological Realities: Readings in the Science of Culture*. Guillemin, J. (ed.). Transaction Publishers, New Brunswick, NJ.
- Barth, F. 1969. *Ethnic Groups and Boundaries*. Little, Brown, Boston.
- Barton, C.M., Clark, G.A., and Bamforth, D.B. eds. 1997. *Rediscovering Darwin: Evolutionary Theory and Archeological Explanation*. Archaeological Papers of the American Anthropological Association 7. Washington, DC.
- Baruch, U. 1986. The Late Holocene Vegetational History of Lake Kinneret (Sea of Galilee), Israel. *Paléorient* 12: 37–48.
- Bar-Yosef, O. 1981a. Neolithic Sites in Sinai. Pp. 217–235 in *Contributions to the Environmental History of Southwest Asia*. Frey, W. and Uerpmann, H.P. (eds.). Reichert, Wiesbaden.
- Bar-Yosef, O. 1981b. The ‘Pre-Pottery Neolithic’ Period in the Southern Levant. Pp. 555–569 in *Préhistoire du Levant*. Cauvin, J. and Sanlaville, P. (eds.). Colloque de CNRS 598, Paris.
- Bar-Yosef, O. 1984. Seasonality among Neolithic Hunter-Gatherers in Southern Sinai. Pp. 145–160 in *Animals and Archaeology: 3. Early Herders and Their Flocks*. Clutton-Brock, J. and Grigson, C. (eds.). British Archaeological Reports International 202, Oxford.
- Bar-Yosef, O. 1986. The Walls of Jericho: An Alternative Interpretation. *Current*

- Bar-Yosef, O. 2002. The Natufian Culture and the Early Neolithic: Social and Economic Trends in Southwest Asia. Pp. 113–126 in *Examining the Farming/Language Dispersal Hypothesis*. Belwood, P. and Renfrew, C. (eds.). McDonald Institute for Archaeological Research, Cambridge University, Cambridge.
- Bar-Yosef, O. 2013. Nile Valley-Levant Interactions: An Eclectic Review. Pp. 237–248 in *Neolitisation of Northeastern Africa*. Shirai, N. (ed.). Studies in Near Eastern Production, Subsistence, and Environment 16, Ex Orient, Berlin.
- Bar-Yosef, O. and Bar-Yosef Mayer, D.E. 2002. Early Neolithic Tribes in the Levant. Pp. 340–371 in *The Archaeology of Tribal Societies*. Parkinson, W.A. (ed.). International Monographs in Prehistory, Ann Arbor, MI.
- Bar-Yosef, O. and Belfer-Cohen, A. 1989. The PPNB Interaction Sphere. Pp. 59–72 in *People and Cultures in Change*. Hershkowitz, I. (ed.). British Archaeological Reports International 508, Oxford.
- Bar-Yosef, O., Belfer-Cohen, A., Goren, A., Herskovitz, I., Mienis, H., Sass, B., and Ilan, O. 1986. Nawamis and Habitation Sites Near Gebel Gunna, Southern Sinai. *Israel Exploration Journal* 36: 121–167.
- Bar-Yosef, O., Belfer-Cohen, A., Goren, A., and Smith, P. 1977. The Nawamis Near Ein Huderah (Eastern Sinai). *Israel Exploration Journal* 27: 65–88.
- Bar-Yosef, O. and Goren, N. 1973. Natufian Remains in Hayonim Cave. *Paléorient* 1: 49–68.
- Bar-Yosef, O., Hershkowitz, I., Arbel, G., and Goren, A. 1983. Orientation of Nawamis Entrances in Southern Sinai: Expressions of Religious Belief or Seasonality? *Tel Aviv* 10: 52–60.
- Bar-Yosef, O. and Khazanov, A.M. 1992. Introduction. Pp. 1–10 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*.
- Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison, [#].
- Bar-Yosef, O. and Phillips, J.L. eds. 1977. *Prehistoric Investigations in Gebel Maghara, Northern Sinai*. Qedem 7, Monographs of the Institute of Archaeology, Hebrew University, Jerusalem.
- Bar-Yosef Mayer, D.E. 1997. Neolithic Shell Production in Southern Sinai. *Journal of Archaeological Science* 24: 97–111.
- Bar-Yosef Mayer, D.E. 1999. *The Role of Shells in the Reconstruction of Socio-Economic Aspects of Neolithic through Early Bronze Age Societies in Sinai*. Unpublished doctoral dissertation, Hebrew University, Jerusalem.
- Bar-Yosef Mayer, D.E. 2005. The Exploitation of Shells as Beads in the Paleolithic and Neolithic of the Levant. *Paléorient* 31: 176–185.
- Bar-Yosef Mayer, D.E. 2007. Archaeomalacological Research in Israel: The

- Current State of Research. *Israel Journal of Earth Sciences* 56: 191–206.
- Bar-Yosef Mayer, D.E. and Porat, N. 2008. Green Stone Beads at the Dawn of Agriculture. *Proceedings of the National Academy of Sciences* 105: 8548–8551.
- Bar-Yosef Mayer, D.E., Porat, N., Gal, Z., and Smithline, H. 2004. Steatite Beads at Peqi'in: Long Distance Trade and Pyro-Technology during the Chalcolithic of the Levant. *Journal of Archaeological Science* 31: 493–502.
- Barzilai, O. 2009. *Social Complexity in the Southern Levantine PPNB as Reflected through Lithic Studies: the Bidirectional Blade Industries*. Unpublished PhD dissertation. The Hebrew University, Jerusalem.
- Barzilai, O. 2010. *Social Complexity in the Southern Levantine PPNB as Reflected through Lithic Studies: The Bidirectional Blade Industries*. Archaeopress, Oxford.
- Barzilai, O. and Goring-Morris, A.N. 2011. Nahal Lavan 1021: A PPNB Knapping Site in the Western Negev Dunes. Pp. 267–276 in *The State of the Stone: Terminologies, Continuities and Contexts in Near Eastern Lithics*. Healey, E., Campbell, S., and Maeda, O. (eds.). Studies in Early Near Eastern Production, Subsistence, and Environment 13, Ex Oriente, Berlin.
- Bate, D.M. 1937. The Fossil Fauna of the Way El-Mughara Caves. Pp. 136–240 in *The Stone Age of Mount Carmel*. Garrod, D.A.E. and Bate, D.M.A. (eds.). Clarendon Press, Oxford.
- Bates, D.G. 1973. *Nomads and Farmers: A Study of the Yoruk of Southeastern Turkey*. Anthropological Papers of the Museum of Anthropology, University of Michigan 52, Ann Arbor.
- Beaver, J.E. 2014. The Built Environment. Pp. 49–68 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- Beck, A., Philip, G., Abdulkarim, M., and Donoghue, D. 2007. Evaluation of Corona and Ikonos High Resolution Satellite Imagery for Archaeological Prospection in Western Syria. *Antiquity* 81: 161–175.
- Beck, L. 1985. *The Qashqa'i of Iran*. Yale University, New Haven.
- Behnke, R.H. 1980. *The Herders of Cyrenaica: Ecology, Economy, and Kinship Among the Bedouin of Eastern Libya*. University of Illinois Press, Urbana.
- Beit-Arieh, I. 1974. An Early Bronze Age II Site at Nabi Salah in Southern Sinai. *Tel Aviv* 1: 144–156.
- Beit-Arieh, I. 1980. A Chalcolithic Site Near Serabit el-Khadim. *Tel Aviv* 7: 45–64.
- Beit-Arieh, I. 1981. An Early Bronze Age II Site near Sheikh 'Awad in Southern Sinai. *Tel Aviv* 8: 95–127.
- Beit-Arieh, I. 1986. Two Cultures in South Sinai in the Third Millennium B.C. *Bulletin of the American Schools of Oriental Research* 263: 27–54.

- Beit-Arieh, I. 2001. The Excavations at Site 917 in the 'Uvda Valley, 1980. *'Atiqot* 62: 95–108.
- Beit-Arieh, I. 2003. *Archaeology of Sinai: The Ophir Expedition*. Tel Aviv University Yass Publications in Archaeology 21, Tel Aviv.
- Beit-Arieh, I. and Gophna, R. 1976. Early Bronze II Sites in Wadi el-Qudeirat (Kadesh Barnea). *Tel Aviv* 3: 142–150.
- Beit-Arieh, I. and Gophna, R. 1981. The Early Bronze Age II Settlement at 'Ain el Qudeirat. *Tel Aviv* 8: 128–133.
- Belmonte, J.A. and González-García, A.C. 2014. On the Orientation of Early Bronze Age Tombs in Ancient Magan. *Mediterranean Archaeology and Archaeometry* 14: 233–246.
- Bemmann, J. and Schmauder, M. (eds.). 2015. Complexity of Interaction along the Eurasian Steppe Zone in the First Millennium CE. Bonn Contributions to Asian Archaeology 7, University of Bonn, Bonn.
- Ben-David, R. 1997. The Geology and Geomorphology of the Nahal 'Oded Site Area. Pp. 109–118 in *The 'Oded Sites: Investigations of Two Early Islamic Pastoral Camps South of the Ramon Crater*. Rosen, S.A. and Avni, G. (eds.). Beer-Sheva XI, Studies by the Department of Bible and Ancient Near East, Ben-Gurion University Press, Beersheva.
- Ben-David, Y. and Orion, E. 1998. Lifeways and Subsistence of the Azazmeh Bedouin of the Negev Highlands. Pp. 27–41 in *Researches in the Archaeology of Pastoral Nomadism in the Negev and Sinai*. Ahituv, S. (ed.). Ben-Gurion University Press, Beersheva. (Hebrew).
- Benecke, N. 2009. Faunal Remains of Tall Ḥujayrāt al-Ghuzlān (Excavations 2000–2004). Pp. 339–354 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23, Mari Leidorf, Rahden.
- Bennett, W.J. Jr., Sollberger, J.B., and Gettys, A.F. 1989. Flint Tools. Pp. 231–256 in *Tell el Hesi: The Persian Period (Stratum V)*. Bennett, W.J. Jr. and Blakely, J.A. (eds.). Eisenbrauns, Winona Lake.
- Betts, A. 1982. Prehistoric Sites at Qa'a Mejalla, Eastern Jordan. *Levant* 14: 1–34.
- Betts, A. 1989. The Solubba: Non-Pastoral Nomads in Arabia. *Bulletin of the American Schools of Oriental Research* 274: 61–70.
- Betts, A.V.G. 1992. Tell el-Hibr: A Rock Shelter Occupation of the Fourth Millennium B.C.E. in the Jordanian Badiya. *Bulletin of the American Schools for Oriental Research* 287: 5–23.
- Betts, A.V.G. 2008. Things to Do with Sheep and Goats: Neolithic Hunter-Forager Herders in North Arabia. Pp. 25–42 in *The Archaeology of Mobility*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Betts, A.V.G., College, S., Martin, L., McCartney, C., Wright, K., and Yagodin, V.

1998. *The Harra and the Hamad: Excavations and Explorations in Eastern Jordan*. Vol. 1. Sheffield Academic Press, Sheffield.
- Betts, A.V.G., Cropper, D., Martin, L., and McCartney, C. 2013. *The Later Prehistory of the Badia: Excavations and Surveys in Eastern Jordan*. Levant Supplementary Series 11, Council for British Archaeology in the Levant, Oxbow, Oxford.
- Betts, A.V.G., van der Borg, K., de Jong, A., McClintock, C., and van Strydonk, M. 1994. Early Cotton in North Arabia. *Journal of Archaeological Science* 21: 489–500.
- Bienkowski, P. 2006. The Wadi Arabah: Meanings in a Contested Landscape. Pp. 7–28 in *Crossing the Rift: Resources, Settlements Patterns, and Interaction in the Wadi Arabah*. Bienkowski, P. and Galor, K. (eds.). Levant Supplementary Series 3, Oxbow, Oxford.
- Bienkowski, P. and van der Steen, E. 2001. Tribes, Trade, and Towns: A New Framework for the Late Iron Age in Southern Jordan and the Negev. *Bulletin of the American Schools of Oriental Research* 323: 21–47.
- Binford, L.R. 1967. Smudge Pits and Hide Smoking: The Use of Analogy in Archaeo-logical Reasoning. *American Antiquity* 32: 1–12.
- Binford, L.R. 1968. Post-Pleistocene Adaptations. Pp. 313–342 in *New Perspectives in Archaeology*. Binford, S.R. and Binford, L.R. (eds.). Aldine, Chicago.
- Binford, L.R. 1980. Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45: 4–20.
- Binford, L.R. 1981a. *Bones: Ancient Men and Modern Myths*. Academic Press, New York.
- Binford, L.R. 1981b. Middle-Range Research and the Role of Actualistic Studies. Pp. 21–30 in *Bones: Ancient Men and Modern Myths*. Binford, L.R. (ed.). Academic Press, New York.
- Bintliff, J. 1975. Mediterranean Alluviation: New Evidence from Archaeology. *Proceedings of the Prehistoric Society* 41: 78–84.
- Biton, R., Goren, Y., and Goring-Morris, A.N. 2014. Ceramics in the Levantine Pre-Pottery Neolithic B: Evidence from Kfar Horesh, Israel. *Journal of Archaeological Science* 41: 740–748.
- Bittman, B. and Sullivan, T.D. 1978. The Pochteca. Pp. 211–218 in *Mesoamerican Communication Routes and Cultural Contacts*. Vols. 40–42. Lee, T.A. and Navarrete, C. (eds.). New World Archaeological Foundation, Brigham Young University, Salt Lake City.
- Black-Michaud, J. 1986. *Sheep and Land*. Cambridge University Press, Cambridge.
- Bookman, R., Bartov, Y., Enzel, Y., and Stein, M. 2006. Quaternary Lake Levels in the Dead Sea Basin: Two Centuries of Research. *Geological Society of*

- Bookman, R., Enzel, Y., Agnon, A., and Stein, M. 2004. Late Holocene Lake Levels of the Dead Sea. *Geological Society of America Bulletin* 116: 555–571.
- Boonzaier, E., Malherbe, C., Smith, A., and Berens, P. 1996. *The Cape Herders: A History of the Khoikhoi of Southern Africa*. David Philip and Ohio University, Capetown and Athens, OH.
- Borofsky, R. 1997. Cook, Lono, Obeyesekere, and Sahlins: CA* Forum on Theory in Anthropology. *Current Anthropology* 38: 255–282.
- Bottero, J. 1954. *Le problème des Habiru*. Imprimerie Nationale, Paris.
- Bourke, S.J. 2002. The Origins of Social Complexity in the Southern Levant: New Evidence from Teleilat Ghassul, Jordan. *Palestine Exploration Quarterly* 134: 2–27.
- Bradbury, J. and Philip, G. 2011. The World Beyond Tells: Pre-Classical Activity in the Basalt Landscape of the Homs region, Syria. Pp. 169–180 in *Standing Stones, Anthropomorphic Stelae, Cultic Aspects of the 4th and 3rd Millennia BC in Arabia and the Southern Levant*. Steimer, T. (ed.). British Archaeological Reports International 2317, Maison de l'Orient/Archaeopress, Lyon, Oxford.
- Braidwood, R.J. 1967 [1948]. *Prehistoric Men* (7th Edition). Scott, Foresman, and Co., Glenview.
- Bright, J. 2000 [1946]. *A History of Israel*. Westminster, Louisville.
- Broadbridge, A.F. 2008. *Kingship and Ideology in the Islamic and Mongol Worlds*. Cambridge University, Cambridge.
- Brochier, J., Villa, P., Giacomarra, M., and Tagliacozzo, A. 1992. Shepherds and Sediments: Geo-Ethnoarchaeology of Pastoral Sites. *Journal of Anthropological Archaeology* 11: 47–102.
- Broughton, J.M. 2002. Prey Spatial Structure and Behavior Affect Archaeological Tests of Optimal Foraging Models: Examples from the Emeryville Shellmound Vertebrate Fauna. *World Archaeology* 34: 60–83.
- Browman, D.L. 1974. Pastoral Nomadism in the Andes. *Current Anthropology* 15: 188–196.
- Browman, D.L. 1989. Origins and Development of Andean Pastoralism: An Overview of the Past 6000 Years. Pp. 256–268 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation*. Clutton Brock, J. (ed.). Unwin-Hyman, London.
- Browman, D.L. 2008. Pastoral Nomadism in the Central Andes. Pp. 161–173 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Brückner, H., Eichmann, R., Herling, L., Kallweit, H., Kerner, S., Khalil, L., and

- Miqdadi, R. 2002. Chalcolithic and Early Bronze Age Sites near 'Aqaba, Jordan. *Orient-Archäologie* 5: 217–331.
- Brugge, D.M. 1983. Navajo Prehistory and History to 1860. Pp. 489–505 in *Handbook of North American Indians*. Vol. 10. Ortiz, A. (ed.). Smithsonian Institution, Washington, DC.
- Bruins, H.J. 1986. *Desert Environment and Agriculture in the Central Negev and Kadesh Barnea during Historical Times*. Midbar Foundation, Nijkerk.
- Bruins, H.J. 2007. Runoff Terraces in the Negev Highlands during the Iron Age: Nomads Settling Down or Farmers Living in the Desert. Pp. 37–43 in *On the Fringe of Society: Archaeological and Ethnoarchaeological Perspectives on Pastoral and Agricultural Societies*. Saidel, B.A. and van der Steen, E.J. (eds.). British Archaeological Reports International 1657, Oxford.
- Bruins, H.J. 2012. Ancient Desert Agriculture in the Negev and Climate-Zone Boundary Changes during Average, Wet, and Drought Years. *Journal of Arid Environments* 86: 28–42.
- Buccellati, G. 2008. The Origin of the Tribe and of 'Industrial' Agro-Pastoralism in Syro-Mesopotamia. Pp. 141–160 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Bulliet, R. 1990. *The Camel and the Wheel*. Columbia University, New York.
- Bulliet, R. 2005. *Hunters, Herders, and Hamburgers, the Past and Future of Human-Animal Relationships*. Columbia University, New York.
- Burian, F. and Friedman, E. 1973. Prehistoric Hunters in the Dunes of Haluza. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 11: 27–34 (Hebrew).
- Burian, F. and Friedman, E. 1975. Prehistoric Sites Near Nahal Sekher. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 13: 59–69. (Hebrew).
- Burian, F. and Friedman, E. 1982. Site 104—Pre-Pottery Neolithic B. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 17: 71–78. (Hebrew).
- Burian, F. and Friedman, E. 1985. Flint Borers: Methods of Production and Use. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 18: 63–66.
- Burian, F. and Friedman, E. 1987. Chalcolithic Borer Industry at Site 103—Nahal Nitzana. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 20: 160–172.
- Burian, F. and Friedman, E. 1988. A Note on the Obsidian Finds from the Pre-Pottery Neolithic B Site 109, Near Nahal Lavan, Negev. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 21: 95–98.
- Burkhardt, J.L. 1968 [1829]. *Travels in Arabia*. Cass, London.
- Burstein, S.M. 2008. Trogodytes = Blemmyes = Beja? The Misuse of Ancient Ethnography. Pp. 250–263 in *The Archaeology of Mobility: Nomads in Old*

- and in *New Worlds*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Butzer, K.W. 1980. Civilizations: Organisms or Systems? *American Scientist* 68: 517–523.
- Butzer, K.W. 1982. *Archaeology as Human Ecology: Method and Theory for a Contextual Approach*. Cambridge University, Cambridge.
- Buzy, R.P.D. 1927. Les stations lithiques d'el Quseimeh. *Revue Biblique* 36: 90–92.
- Byers, D.A. and Ugan, A. 2005. Should We Expect Large Game Specialization in the Late Pleistocene? An Optimal Foraging Perspective on Early Paleoindian Prey Choice. *Journal of Archaeological Science* 32: 1624–1640.
- Byrd, B.F. 1992. The Dispersal of Food Production Across the Levant. Pp. 49–61 in *Transitions to Agriculture in Prehistory*. Gebauer, A.B. and Price, T.D. (eds.). Monographs in World Archaeology 4, Prehistory Press, Madison.
- Campbell, D.J. 1984. Response to Drought among Farmers and Herders in Southern Kajiado District, Kenya. *Human Ecology* 12: 35–64.
- Canaan, T. 1933. *The Palestinian Arab House, Its Architecture and Folklore*. Syrian Orphanage Press, Jerusalem.
- Caner, D., Brock, S.P., Van Bladel, K.T., and Price, R. 2010. *History and Hagiography from the Late Antique Sinai: Including Translations of Pseudo-Nilus' Narrations, Ammonius' Report on the Slaughter of the Monks of Sinai and Rhaithou, and Anastasius of Sinai's Tales of the Sinai Fathers*. Liverpool University Press, Liverpool.
- Canti, M.G. 1997. An Investigation of Microscopic Calcareous Spherulites from Herbivore Dung. *Journal of Archaeological Science* 24: 219–231.
- Carr, C.J. 1977. *Pastoralism in Crisis: The Dasanetch and Their Ethiopian Lands*. University of Chicago Geography Research Paper 180, Chicago.
- Casteel, R.W. 1977. Characterization of Faunal Assemblages and the Minimum Number of Individuals Determined from Paired Elements: Continuing Problem in Archaeology. *Journal of Archaeological Science* 4: 125–134.
- Cauvin, J. 2000a. The Symbolic Foundations of the Neolithic Revolution in the Near East. Pp. 235–252 in *Life in Neolithic Farming Communities*. Kuijt, I. (ed.). Kluwer, New York.
- Cauvin, J. 2000b. *The Birth of the Gods and the Origins of Agriculture*. Cambridge University Press, Cambridge.
- Chamel, B. 2014. *Bioanthropologie et pratiques funéraires des populations néolithiques du Proche-Orient: l'impact de la néolithisation (Étude de sept sites syriens—9820–6000 cal. BC)*. Université Lumière Lyon 2, UMR 5133 Archéorient—Maison de l'Orient et de la Méditerranée. École doctorale des sciences sociales (ED 483).
- Chang, C. 2008. Mobility and Sedentism of the Iron Age Agro-Pastoralists of

- Southeast Kazakhstan. Pp. 329–342 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, UCLA, Los Angeles.
- Chang, C. 2015. The Study of Nomads in the Republic of Kazakhstan. Pp. 17–40 in *The Ecology of Pastoralism*. Kardulias, P.N. (ed.). University of Colorado, Boulder.
- Chang, C. and Koster, H.A. 1986. Beyond Bones: Toward an Archaeology of Pastoralism. *Advances in Archaeological Method and Theory* 9: 97–148.
- Chang, C. and Koster, H.A. eds. 1994. *Pastoralists at the Periphery: Herders in a Capitalist World*. University of Arizona, Tucson.
- Cherry, J.F. 2003. Archaeology Beyond the Site: Regional Survey and Its Future. Pp. 137–159 in *Theory and Practice in Mediterranean Archaeology: Old World and New World Perspectives*. Papadopoulos, J. and Leventhal, R. (eds.). Cotsen Advanced Seminars 1, UCLA, Los Angeles.
- Chiera, E. 1934. *Sumerian Epics and Myths*. University of Chicago, Chicago.
- Childe, V.G. 1951. *Man Makes Himself*. New American Library, New York.
- Clark, J.D. 1975–1977. Interpretation of Prehistoric Technology from Ancient Egypt and Other Sources, Part 2: Prehistoric Arrow Forms in Africa as Shown by Surviving Examples of Traditional Arrows from Ancient Egypt and Other Sources. *Paléorient* 3: 127–150.
- Clark, J.D., Philips, J.L., and Staley, P.S. 1974. Interpretations of Prehistoric Technology from Ancient Egyptian and Other Sources Part 1: Ancient Egyptian Bows and Arrows and Their Relevance for African Prehistory. *Paléorient* 2: 323–388.
- Clarke, D.L. 1978. *Analytical Archeology*. Columbia University, New York.
- Clutton-Brock, J. 1981. *Domesticated Animals from Early Times*. University of Texas, Austin.
- Clutton-Brock, J. 2012. *Animals as Domesticates: A World View through History*. Michigan State University, East Lansing.
- Coe, M.D. 1992. *Breaking the Maya Code*. Thames and Hudson, New York.
- Cohen, A. 1973. *Palestine in the 18th Century*. Magnes, Jerusalem.
- Cohen, R. 1980. The Iron Age Fortresses in the Central Negev. *Bulletin of the American Schools of Oriental Research* 236: 61–79.
- Cohen, R. 1982. New Light on the Date of the Petra-Gaza Road. *Biblical Archaeologist* 45: 240–247.
- Cohen, R. 1983. The Mysterious MB I People. *Biblical Archaeology Review* 9: 16–29.
- Cohen, R. 1999. *Ancient Settlement of the Central Negev*. Israel Antiquities Authority Reports 6, Jerusalem. (Hebrew).
- Cohen, R. and Bernick-Greenberg, H. 2007. *Excavations at Kadesh Barnea (Tell el-Qudeirat) 1976–1982*. Israel Antiquities Authority Reports 34, Jerusalem.

- Cohen, R. and Cohen-Amin, R. 2004. *Ancient Settlement of the Negev Highlands: The Iron Age and the Persian Period*. Israel Antiquities Authority Reports 20, Jerusalem.
- Cohen, R. and Dever, W.G. 1978. Preliminary Report of the Pilot Season of the 'Central Negev Highlands Project'. *Bulletin of the American Schools of Oriental Research* 232: 29–45.
- Cohen, R. and Dever, W.G. 1981. Preliminary Report of the Third and Final Season of the 'Central Negev Highlands Project'. *Bulletin of the American Schools of Oriental Research* 243: 57–77.
- Cohen-Weinberger, A. and Saidel, B.A. 2014. Ceramic Petrography. Pp. 230–244 in *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. Saidel, B.A. and Haiman, M. (eds.). British Archaeological Reports International 2684, Archaeopress, Oxford.
- Cole, D.P. 1975. *Nomads of the Nomads: The Al Murrah Bedouin of the Empty Quarter*. Harlan Davidson, Arlington Heights, IL.
- Coles, J. 1973. *Archaeology by Experiment*. Scribner's, New York.
- Conder, C.R. and Kitchen, H.H. 1881–1885. *The Survey of Western Palestine: Memoirs of the Topography, Orography, Hydrography, and Archaeology*. Palestine Exploration Fund, London.
- Coogan, M.D. 1984. Numeira 1981. *Bulletin of the American Schools of Oriental Research* 255: 75–81.
- Cooke, L. 2013. Bead Working. Pp. 26–30 in *The Later Prehistory of the Badia: Excavations and Surveys in Eastern Jordan*. Betts, A.V.G., Cropper, D., Martin, L., and McCartney, C. (eds.). Levant Supplementary Series 11, Council for British Archaeology in the Levant, Oxbow, Oxford.
- Cooper, M.C. and Schoedsack, E.B. (Producers). 1925. *Grass: A Nation's Battle for Life*. Famous Players-Lasky Corporation and Paramount Pictures, Los Angeles.
- Cope, C. 1991. Gazelle Hunting Strategies in the Southern Levant. Pp. 341–358 in *The Natufi an Culture in the Levant*. Bar-Yosef, O. and Valla, F.R. (eds.). International Monographs in Prehistory, Archaeological Series 1, Ann Arbor.
- Cordell, L. and McBrinn, M.E. 2012. *Archaeology of the Southwest*. Left Coast Press, Walnut Creek.
- Cordova, C.E. 2000. Geomorphological Evidence of Intensive Soil Erosion in the Highlands of Central Jordan. *Physical Geography* 21: 538–567.
- Cordova, C.E. 2007. *Millennial Landscape Change in Jordan: Geoarchaeology and Cultural Ecology*. University of Arizona, Tucson.
- Crabtree, P.J. 1993. Early Animal Domestication in the Middle East and Europe. *Archaeo-logical Method and Theory* 5: 201–245.
- Crabtree, P.J., Campana, D.V., and Ryan, K. eds. 1989. *Early Animal*

- Domestication and Its Cultural Context*. University of Pennsylvania Museum and MASCA, Philadelphia.
- Cribb, R. 1987. The Logic of the Herd: A Computer Simulation of Herd Structure. *Journal of Anthropological Archaeology* 6: 376–415.
- Cribb, R. 1991. *Nomads in Archaeology*. Cambridge University, Cambridge.
- Crowfoot Payne, J. 1978. A Hoard of Flint Knives from the Negev. Pp. 19–21 in *Archaeology in the Levant*. Moorey, P.R. and Parr, P. (eds.). Aris and Phillips, London.
- Curry, A. 2013. The Milk Revolution. *Nature* 500: 20–22.
- Dahari, U. 2000. *Monastic Settlements in South Sinai in the Byzantine Period*. Israel Antiquities Authority Reports 9, Jerusalem.
- Dahl, G. and Hjort, A. 1979. *Pastoral Change and the Role of Drought*. Swedish Agency for Research Cooperation with Developing Countries Report R2, Stockholm.
- Daniel, G. 1975. *A Hundred and Fifty Years of Archaeology*. Duckworth, London.
- Danin, A. 1983. *Desert Vegetation of Israel and Sinai*. Cana, Jerusalem.
- Danin, A. 1985. Palaeoclimates in Israel: Evidence from Weathering Patterns of Stones in and near Archaeological Sites. *Bulletin of the American Schools of Oriental Research* 259: 33–43.
- Darwin, C. 1859 [1872]. *The Origin of Species* (6th edition). Collier, New York.
- Davis, S.J.M. 1982. Climatic Change and the Advent of Domestication: The Succession of Ruminant Artiodactyls in the Late Pleistocene–Holocene in the Israel Region. *Paléorient* 8(2): 5–15.
- Davis, S.J.M. 1987. *The Archaeology of Animals*. Batsford, London.
- Davis, S.J.M. 2003. The Zooarchaeology of Khirokitia (Neolithic Cyprus), Including a View from the Mainland. Pp. 253–268 in *Le Néolithique de Chypre. Actes du Colloque International*. Guilaine, J. and Le Brun, A. (eds.). Cyprus Department of Antiquities, Nicosia.
- Davis, S.J.M., Goring-Morris, N., and Gopher, A. 1982. Sheep Bones from the Negev Epipaleolithic. *Paléorient* 8: 87–93.
- Davis, S.J.M. and Valla, F. 1978. Evidence for the Domestication of the Dog 12,000 Years Ago in the Natufian of Israel. *Nature* 276: 608–610.
- Dawkins, R. 1986. *The Blind Watchmaker*. Norton, London.
- Dayan, T. 1994. Early Domesticated Dogs of the Near East. *Journal of Archaeological Science* 21: 633–640.
- Dayan, T. and Simberloff, D. 1995. Natufian Gazelles: Proto-Domestication Reconsidered. *Journal of Archaeological Science* 22: 671–675.
- Dayan, T., Tchernov, E., Bar-Yosef, O., and Yom-Tov, Y. 1986. Animal Exploitation in Ujrat el Mehed, a Neolithic Site in Southern Sinai. *Paléorient* 12: 105–116.

- Dean, R. 2014. Hunting and Herding at Ayn Abu Nukhayla: The Vertebrate Faunal Assemblage. Pp. 69–90 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- de Miroschedji, P. 1986. Ceramiques et mouvements de populations: le cas de la Palestine au IIIe millenaire. Pp. 10–46 in *A propos des interpretations archaeologiques de la poterie*. Barrelet, M.T. and Gardin, J.C. (eds.). Editions recherche sur les civilisations (ERC), Paris.
- de Miroschedji, P. 2014. The Southern Levant (Cisjordan) during the Early Bronze Age. Pp. 307–329 in *The Oxford Handbook of the Archaeology of the Levant: C. 8000–332 BC*. Steiner, M.L. and Killebrew, A.E. (eds.). Oxford University, Oxford.
- Dever, W.G. 1980. New Vistas on the EB IV ('MB I') Horizon in Syria-Palestine. *Bulletin of the American Schools of Oriental Research* 237: 35–64.
- Dever, W.G. 1987. Archaeological Sources for the History of Palestine: The Middle Bronze Age: The Zenith of the Urban Canaanite Era. *The Biblical Archaeologist* 50: 148–177.
- Dever, W.G. 1992. Pastoralism and the End of the Urban Bronze Age in Palestine. Pp. 83–92 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison, WI.
- Dever, W.G. 1995. Ceramics, Ethnicity, and the Question of Israel's Origins. *The Biblical Archaeologist* 58: 200–213.
- Dever, W.G. 2014. *Excavations at the Early Bronze IV Sites of Jebel Qa'aqir and Be'er Resisim*. Eisenbrauns, Winona Lake, IN.
- Devore, I., Murdock, G.P., and Whiting, B.B. 1968. 35a: Are the Hunter-Gatherers a Cultural Type? Pp. 335–339 in *Man the Hunter*. Lee, R.B. and DeVore, I. (eds.). Aldine, Chicago.
- Di Cosmo, N. 2010. Ethnography of the Nomads and 'Barbarian' History in Han China. Pp. 297–324 in *Intentional History, Spinning Time in Ancient Greece*. Foxhall, L., Gehrke, H.J., and Lurgahi, N. (eds.). Franz Steiner, Stuttgart.
- Di Cosmo, N. 2015. China-Steppe Relations in Historical Perspective. Pp. 49–72 in *Complexity of Interaction along the Eurasian Steppe Zone in the First Millennium CE*. Bem-mann, J. and Schmauder, M. (eds.). Bonn Contributions to Asian Archaeology 7, University of Bonn, Bonn.
- Dijkstra, J. 2012. Blemmyes, Noumades and the Eastern Desert in Late Antiquity. Reassessing the Written Sources. Pp. 238–247 in *History of the Peoples of the Eastern Desert*. Barnard, H. and Duistermaat, K. (eds.). Cotsen Institute of Archaeology Monograph 73, UCLA, Los Angeles.
- Di Lernia, S. 2001. Dismantling Dung: Delayed Use of Food Resources Among

- Early Holocene Foragers of the Libyan Sahara. *Journal of Anthropological Archaeology* 20: 408–441.
- Diodorus Siculus. http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Diodorus_Siculus/.
- Doughty, C.M. 1979 [1836]. *Travels in Arabia Deserta*. Vol. 1. Cape, London. (Facsimile edition, Dover Publications).
- Drake, N.A., Blench, R.M., Armitage, S.J., Bristow, C.S., and White, K.H. 2011. Ancient Watercourses and Biogeography of the Sahara Explain the Peopling of the Desert. *Proceedings of the National Academy of Sciences* 108: 458–462.
- Drews, R. 2000. Medinet Habu: Ox carts, Ships, and Migration Theories. *Journal of Near Eastern Studies* 59: 161–190.
- Driscoll, C.A., Menotti-Raymond, M., Roca, A.L., Hupe, K., Johnson, W.E., Geffen, E., Harley, E.H., Delibes, M., Pontier, D., Kitchener, A.C., Yamaguchi, N., O'Brien, S.J., and Macdonald, D.W. 2007. The Near Eastern Origin of Cat Domestication. *Science* 317: 519–522.
- Duistermaat, K. and Akkermans, P.M.M.G. 1996. Of Storage and Nomads: The Sealings from Late Neolithic, Sabi Abyad, Syria. *Paléorient* 22: 17–44.
- Dyson-Hudson, N. 1972. The Study of Nomads. Pp. 2–29 in *Perspectives on Nomadism*. Irons, W. and Dyson-Hudson, N. (eds.). Brill, Leiden.
- Dyson-Hudson, R. and Dyson-Hudson, N. 1980. Nomadic Pastoralism. *Annual Review of Anthropology* 9: 15–61.
- Eastwood, W.J., Roberts, N., Lamb, H.F., and Tibby, J.C. 1999. Holocene Environmental Change in Southwest Turkey: A Palaeoecological Record of Lake and Catchment-Related Changes. *Quaternary Science Reviews* 18: 671–695.
- Echallier, J.C. and Braemer, F. 1995. Nature et fonctions des «desert kites»: données et hypothèses nouvelles. *Paléorient* 21: 35–63.
- Eddy, F.W. and Wendorf, F. 1999. *An Archaeological Investigation of the Central Sinai, Egypt*. The American Research Center in Egypt and the University of Colorado, Boulder.
- Edelman, D. 1992. Review of Lemche, N.P. *Ancient Israel: A New History of Israelite Society*. *Journal of Near Eastern Studies* 51: 312–314.
- Edelstein, G., Milevski, I., and Aurant, S. 1998. *Villages, Terraces, and Stone Mounds: Excavations at Manahat, Jerusalem: 1987–1989*. Israel Antiquities Authority Reports 3, Jerusalem.
- Effenberger, A. 2012. *Assets of Lasting Value—The Whereabouts of Animals in Archaeological Sites: The Reflection of Early Domestication in Architecture and Social-Economic Organization during the Levantine Pre-Pottery Neolithic Period*. Unpublished doctoral dissertation, University of Haifa, Haifa. (Hebrew).

- Eichmann, R., Khalil, L., and Schmidt, K. 2009. Excavations at Tall Ḥujayrāt al-Ghuzlān ('Aqaba/Jordan), Excavations 1998–2005 and Stratigraphy. Pp. 17–78 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23. Mari Leidorf, Rahden.
- Eisenberg-Degen, D. 2010. A Hunting Scene from the Negev: The Depiction of a Desert Kite and Throwing Weapon. *Israel Exploration Journal* 60: 146–166.
- Eisenberg-Degen, D. 2012. *Rock Art of the Central Negev: Documentation, Stylistic Analysis, Chronological Aspects, the Relation Between Rock Art and the Natural Surroundings, and Reflections on the Mark Makers Society through the Art*. Unpublished doctoral dissertation, Ben-Gurion University of the Negev, Beer-Sheva.
- Eisenberg-Degen, D. and Nash, G. 2014. Hunting and Gender as Reflected in the Central Negev Rock Art, Israel. *Time and Mind* 7: 259–277.
- Eisenberg-Degen, D. and Rosen, S.A. 2013. Chronological Trends in Negev Rock-Art: The Har Michia Petroglyphs as a Test Case. *Arts* 2: 225–252.
- Eitam, D. 1980. The 'Fortresses' of the Negev Uplands—Settlement Sites. *Qadmoniot* 13: 56–57 (Hebrew).
- el Aref, A. 1934. *The Bedouin Tribes in Beer-Sheva District*. Bostnai, Jerusalem.
- el Aref, A. 1944. *Bedouin Love, Law, and Legend: Dealing Exclusively with the Badu of Beer-sheva*. Cosmos Publishing Company, Jerusalem.
- Eldar, I., Nir, Y., and Nahlieli, D. 1992. The Bedouin and Their Campsites in the Dimona Region of the Negev: Comparative Models for the Study of Ancient Desert Settlements. Pp. 205–219 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison, WI.
- El-Moslimany, A. 1994. Evidence of Early Holocene Summer Precipitation in the Continental Middle East. Pp. 121–130 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). Radiocarbon, University of Arizona, Tucson.
- Eloul, R. 2010. *Culture Change in a Bedouin Tribe: The 'arab al-Ḥġerāt, Lower Galilee, A.D. 1790–1977*. Anthropological Papers of the Museum of Anthropology 97, University of Michigan, Ann Arbor.
- Enzel, Y., Amit, R., Dayan, U., Crouvi, O., Kahana, R., Ziv, B., and Sharon, D. 2008. The Climatic and Physiographic Controls of the Eastern Mediterranean over the Late Pleistocene Climates in the Southern Levant and Its Neighboring Deserts. *Global and Planetary Change* 60: 165–192.
- Eph'al, I. 1984. *The Ancient Arabs*. Magnes Press, Jerusalem.
- Epstein, E. 1939. Bedouin of the Negeb. *Palestine Exploration Quarterly* 71: 59–73.

- Erickson-Gini, T. 2012. Nabataean Agriculture: Myth and Reality. *Journal of Arid Environments* 86: 50–54.
- Erickson-Gini, T. and Israel, Y. 2013. Excavating the Nabataean Incense Road. *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 1: 24–53.
- Evans-Pritchard, E.E. 1940. *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic Tribe*. Clarendon Press, Oxford.
- Evenari, M., Shanan, L., and Tadmor, N. 1982. *The Negev, the Challenge of a Desert*. Harvard University, Cambridge, MA.
- Evershed, R.P., Payne, S., Sherratt, A.G., Copley, M.S., Coolidge, J., Urem-Kotsu, D., Kotsakis, K., Ozdogan, M., Ozdogan, A.E., Nieuwenhuys, O., Akkermans, P.M.M.G., Bailey, D., Andeescu, R.R., Campbell, S., Farid, S., Hodder, I., Yalman, N., Ozbasaran, M., Bıçakçı, E., Garfinkel, Y., Levy, T., and Burton, M.M. 2008. Earliest Date for Milk Use in the Near East and Southeastern Europe Linked to Cattle Herding. *Nature* 455: 528–531.
- Fabian, P. 1996. Evidence of Earthquake Destruction in the Archaeological Record—The Case of Ancient Avdat. *Big Cities World Conference on Natural Disaster Mitigation in Conjunction with the 10th International Seminar on Earthquake Prognostics, Soil Dynamics and Earthquake Engineering* 15: 5–10.
- Fargo, V.M. 1979. Early Bronze Age Pottery at Tell el-Hesi. *Bulletin of the American Schools of Oriental Research* 236: 23–40.
- Farouqi, S. 1996. *Pilgrims and Sultans: The Hajj under the Ottomans 1517–1683*. Tauris, London.
- Faust, A. 2006. The Negev ‘Fortresses’ in Context: Reexamining the ‘Fortress’ Phenomenon in Light of General Settlement Processes of the Eleventh–Tenth Centuries B.C.E. *Journal of the American Oriental Society* 126: 135–160.
- Feige, M. and Shilony, Z. eds. 2008. *A Spade to Dig With: Archaeology and Nationalism in the Land of Israel*. Ben-Gurion Institute, Sede Boquer. (Hebrew).
- Finkelstein, I. 1984. The Iron Age ‘Fortresses’ of the Negev Highlands: Sedentarization of the Nomads. *Tel Aviv* 11: 189–209.
- Finkelstein, I. 1990. Early Arad—Urbanism of the Nomads. *Zeitschrift des Deutschen Palästina-Vereins* 106: 34–50.
- Finkelstein, I. 1995. *Living on the Fringe*. Sheffield Academic Press, Sheffield.
- Finkelstein, I. and Perevoletsky, A. 1990. Processes of Sedentarization and Nomadization in the History of the Negev and Sinai. *Bulletin of the American Schools of Oriental Research* 279: 67–88.
- Finlayson, B., Kuijt, I., Mithen, S., and Smith, S. 2011. New evidence from Southern Jordan: Rethinking the Role of Architecture in Changing Societies

- at the Beginning of the Neolithic Process. *Paléorient* 37: 123–135.
- Flannery, K.V. 1972. The Origins of the Village as a Settlement Type in Mesoamerica and the Near East. Pp. 23–56 in *Man, Settlement and Urbanism*. Ucko, P., Tringham, R., and Dimbleby, G. (eds.). Duckworth, London.
- Fleming, D.E. 2004. *Democracy's Ancient Ancestors*. Cambridge University, Cambridge.
- Fleming, D.E. 2009. Kinship of City and Tribe Conjoined: Zimir-Lin at Mari. Pp. 227–240 in *Nomads, Tribes and the State in the Ancient Near East: Cross-Disciplinary Perspectives*. Szuchman, J. (ed.). The Oriental Institute of the University of Chicago Seminar 5, Chicago.
- Fletcher, R. 2008. Some Spatial Analyses of Chalcolithic Settlement in Southern Israel. *Journal of Archaeological Science* 35: 2048–2058.
- Flores-Ochoa, J.A. 1979. *Pastoralists of the Andes: The Alpaca Herders of Paratia*. Institute for the Study of Human Issues, Philadelphia.
- Foley, R. 1981. Off-Site Archaeology: An Alternative Approach for the Short-Sited. Pp. 157–183 in *Pattern of the Past: Studies in Honour of David Clarke*. Hodder, I., Isaac, G., and Hammond, N. (eds.). Cambridge University, Cambridge.
- Forde, C.D. 1934. *Habitat, Economy and Society; a Geographical Introduction to Ethnology*. Harcourt Brace, New York.
- Frachetti, M.D. 2008. *Pastoralist Landscapes and Social Interaction in Bronze Age Eurasia*. University of California, Berkeley.
- Frachetti, M.D. 2012. Multiregional Emergence of Mobile Pastoralism and Nonuniform Institutional Complexity across Eurasia. *Current Anthropology* 53: 2–38.
- Freikman, M. 2012. A Near Eastern Megalithic Monument in Context. *eTopoi Journal for Ancient Studies* 3: 143–147.
- Frendo, A.J. 1996. The Capabilities and Limitations of Ancient Near Eastern Nomadic Archaeology. *Orientalia* (New Series) 65: 1–23.
- Friedman, R.E. 1987. *Who Wrote the Bible?* Prentice Hall, Bergen County.
- Frison, G. 2004. *Survival by Hunting: Prehistoric Human Predators and Animal Prey*. University of California, Berkeley.
- Fritz, V. 1981. The Israelite 'Conquest' in the Light of Recent Excavations at Khirbet el-Meshâsh. *Bulletin of the American Schools of Oriental Research* 241: 61–73.
- Frumkin, A., Carmi, I., Zak, I., and Magaritz, M. 1994. Middle Holocene Environmental Change Determined from the Salt Caves of Mount Sedom, Israel. Pp. 315–322 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). University of Arizona, Radiocarbon, Tucson.
- Frumkin, A., Greenbaum, N., and Schick, A. 1998. Paleohydrology of the

- Northern Negev: Comparative Evaluation of Two Catchments. Pp. 97–112 in *Water, Environment, and Society in Times of Climatic Change*. Issar, I. and Brown, N. (eds.). Kluwer, Dordrecht.
- Frumkin, A., Magaritz, M., Carmi, I., and Zak, I. 1991. The Holocene Climatic Record of the Salt Caves of Mount Sedom, Israel. *The Holocene* 1: 191–200.
- Fujii, S. 1998. Qa'abu Tulayha West: An Interim Report of the 1997 Season. *Annual of the Department of Antiquities of Jordan* 42: 123–140.
- Fujii, S. 1999. Qa'abu Tulayha West: An Interim Report of the 1998 Season. *Annual of the Department of Antiquities of Jordan* 43: 69–89.
- Fujii, S. 2011. 'Lost Property' at Wadi Qusayr 173: Evidence for the Transportation of Tabular Scrapers in the Jafr Basin, Southern Jordan. *Levant* 43: 1–14.
- Fuller, D.Q., Allaby, R.G., and Stevens, C. 2010. Domestication as Innovation: The Entanglement of Techniques, Technology and Chance in the Domestication of Cereal Crops. *World Archaeology* 42: 13–28.
- Galili, E. and Kark, R. 2011. Burial Grounds of Bedouin Society in the Negev: Preliminary Typology and Spatial Distribution 1900–1966. *The New East (HaMizrach HeHa-dash)* 50: 113–132. (Hebrew).
- Galili, E. and Nir, Y. 1993. The Submerged Pre-Pottery Neolithic Water Well of AtlitYam, Northern Israel, and Its Palaeoenvironmental Implications. *The Holocene* 3: 265–270.
- Garfinkel, Y. 1987a. Yiftahel: A Neolithic Village from the Seventh Millennium BC in Lower Galilee, Israel. *Journal of Field Archaeology* 14: 199–212.
- Garfinkel, Y. 1987b. Bead Manufacture at the Pre-Pottery Neolithic Site of Yiftahel. *Mitekufat Haeven (Journal of the Israel Prehistoric Society)* 20: 79*–90*.
- Garfinkel, Y. and Dag, D. 2008. *Neolithic Ashkelon*. Qedem 47. Hebrew University, Jerusalem.
- Garfinkel, Y., Dag, D., Horwitz, L.K., Lernau, O., and Mienis, H.K. 2002. Ziqim, a Pottery Neolithic Site in the Southern Coastal Plain: A Final Report. *Journal of the Israel Prehistoric Society* 32: 73–145.
- Garfinkel, Y. and Epstein, C. 1999. *Neolithic and Chalcolithic Pottery of the Southern Levant*. Qedem 39, Hebrew University, Jerusalem.
- Garfinkel, Y., Vered, A., and Bar-Yosef, O. 2006. The Domestication of Water: The Neolithic Well at Sha'ar Hagolan, Jordan Valley, Israel. *Antiquity* 80: 686–696.
- Garrard, A.N. 1998. Environment and Cultural Adaptations in the Azraq Basin: 24,000–7,000 BP. Pp. 139–148 in *The Prehistoric Archaeology of Jordan*. Henry, D.O. (ed.). British Archaeological Reports International 705, Oxford.
- Garrard, A.N., Baird, D., and Byrd, B.F. 1994a. The Chronological Basis and Significance of the Late Paleolithic and Neolithic Sequence in the Azraq

- Basin, Jordan. Pp. 177–199 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). University of Arizona and Radiocarbon, Tucson.
- Garrard, A.N., Baird, D., Colledge, S., Martin, L., and Wright, K. 1994b. Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1987 and 1988 Excavation Seasons. *Levant* 26: 73–109.
- Garrard, A.N., Betts, A., Byrd, B., and Hunt, C. 1987. Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1985 Excavation Season. *Levant* 19: 5–25.
- Garrard, A.N. and Byrd, B. 2013. *Beyond the Fertile Crescent: Late Palaeolithic and Neolithic Communities of the Jordanian Steppe: The Azraq Basin Project Volume 1: Project Background and the Late Palaeolithic (Geological Context and Technology)*. Vol. 13. Oxbow Books, Oxford.
- Garrard, A.N., Byrd, B., Harvey, P., and Hivernel, F. 1985. Prehistoric Environment and Settlement in the Azraq Basin: A Report on the 1982 Survey Season. *Levant* 17: 1–28.
- Garrard, A.N., Colledge, S., and Martin, L. 1996. The Emergence of Crop Cultivation and Caprine Herding in the ‘Marginal Zone’ of the Southern Levant. Pp. 204–226 in *The Origins and Spread of Agriculture and Pastoralism in Eurasia*. Harris, D.R. (ed.). University College Press, London.
- Garrod, D.A.E. and Bate, D.M.A. 1937. *The Stone Age of Mount Carmel*. Vol. 1. Clarendon Press, Oxford.
- Garrod, D.A.E. and Bate, D.M.A. 1942. Excavations at the Cave of Shukbah, Palestine, 1928. *Proceedings of the Prehistoric Society* 8: 1–20.
- Garstang, J. 1932. Jericho: City and Necropolis. *Liverpool Annals of Archaeology and Anthropology* 19: 3–22.
- Gasco, A. 2014. Familia Camelidae: variabilidad métrica actual y gradiente de tamaño corporal. Pp. 109–161 in *Arqueología de Ambiente de Altura de Mendoza y San Juan (Argentina)*. Cortegoso, V., Durán, A., and Gasco, A. (eds.). EDIUNC, Mendoza.
- Gasparyan, B., Khechoyan, A., Bar-Oz, G., Malkinson, D., Nachmias, A., and Nadel, D. 2013 The Northernmost Kites in South-West Asia: The Fringes of the Ararat Depression (Armenia) Project. *Antiquity* 87(336). <http://antiquity.ac.uk/projgall/bar-oz336/>.
- Gaster, T.H. 1969. *Myth, Legend, and Custom in the Old Testament*. Harper & Row, New York and Evanston.
- Gates, M.H. 1992. Nomadic Pastoralists and the Chalcolithic Hoard from Nahal Mishmar. *Levant* 24: 131–139.
- Gauthier-Pilters, H. and Dagg, A.I. 1981. *The Camel, Its Evolution, Ecology, Behavior, and Relationship to Man*. University of Chicago, Chicago.
- Gebel, H.G.K. 2004. Central to What? The Centrality Issue of the LPPNB

- Mega-Site Phenomenon in Jordan. Pp. 1–19 in *Central Settlements in Neolithic Jordan*. Biemert, H.D., Gebel, H.D.K., and Neef, R. (eds.). Studies in Early Near Eastern Production, Subsistence and Environment 5, Ex Orient, Berlin.
- Gellner, E. 1984. Foreword. Pp. ix–xxvi in *Nomads and the Outside World*. Khazanov, A.M. (ed.). Cambridge University, Cambridge.
- Genz, H. 2000. The Organisation of Early Bronze Age Metalworking in the Southern Levant. *Paléorient* 26: 55–65.
- Gerbault, P., Bollongino, R., Burger, J., and Thomas, M.G. 2013. Inferring Process of Neolithic Gene-Culture Co-Evolution Using Genetic and Archaeological Data: The Case of Lactase Persistence and Dairying. Pp. 37–48 in *The Origins and Spread of Domestic Animals in Southwest Asia and Europe*. Colledge, S., Conolly, J., Dobney, K., Manning, K., and Shennan, S. (eds.). Left Coast Press, Walnut Creek.
- Gersht, D. 2003. Flint Assemblages from the Excavated Sites. Pp. 129–183 in *Archaeology of Sinai*. Beit-Arieh, I. (ed.). Tel Aviv University Yass Publications in Archaeology 21. Tel Aviv.
- Geyh, M.A. 1994. The Paleohydrology of the Eastern Mediterranean. Pp. 131–145 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). University of Arizona and Radiocarbon, Tucson.
- Gilbert, A.S. 1983. On the Origins of Specialized Nomadic Pastoralism in Western Iran. *World Archaeology* 15: 104–119.
- Gilead, I. 1988. The Chalcolithic Period in the Levant. *Journal of World Prehistory* 2: 397–443.
- Gilead, I. 1990. The Neolithic-Chalcolithic Transition and the Qatifian of the Northern Negev and Sinai. *Levant* 27: 47–63.
- Gilead, I. 1995. *A Chalcolithic Site in the Northern Negev*. Beersheva VII, Ben-Gurion University, Beersheva.
- Gilead, I. 2011. Chalcolithic Culture History: Ghassulian and Other Entities in the Southern Levant. Pp. 12–14 in *Culture, Chronology and the Chalcolithic: Theory and Transition*. Lovell, J. and Rowan, Y. (eds.). Council for British Research in the Levant, London.
- Gilead, I. and Goren, Y. 1986. Stations of the Chalcolithic Period in Nahal Sekher, Northern Negev. *Paléorient* 12: 83–90.
- Gilead, I. and Goren, Y. 1995. Pottery Assemblages from Garar. In Gilead, I. (ed.). *Garar: A Chalcolithic Site in the Northern Negev*. Beersheva VII: Studies by the Department of Bible and Ancient Near East. Ben-Gurion University Press: Beersheva. Pp. 137–222.
- Gilead, I., Hershman, D., and Marder, O. 1995. The Flint Assemblages from Garar. Pp. 223–280 in *Garar, a Chalcolithic Site in the Northern Negev*.

- Gilead, I. (ed.). Beer-Sheva VII, Ben-Gurion University, Beersheva.
- Ginguld, M., Perevolotsky, A., and Ungar, E.D. 1997. Living on the Margins: Livelihood Strategies of Bedouin Herd-Owners in the Northern Negev, Israel. *Human Ecology* 25: 567–591.
- Giraud, J. and Cleuziou, S. 2009. Funerary Landscape as Part of the Social Landscape and Its Perceptions: 3000 Early Bronze Age Burials in the Eastern Ja'lān (Sultanate of Oman). *Proceedings of the Seminar for Arabian Studies* 39: 163–180.
- Giveon, R. 1971. *Les Bedouins Shosou des documents Egyptiens*. Documenta et Monumenta Orientis Antiqui XVIII, Leiden, Brill.
- Glass, J. 1978. Petrographical and Technological Analyses of Pottery. Pp. 43–44, 50–51 in *Early Arad I: The Chalcolithic Settlement and Early Bronze City, I: First-Fifth Seasons of Excavations, 1962–1966*. Amiran, R., Paran, U., Shiloh, Y., Brown, R., Tsafir, Y., and Ben-Tor, A. (eds.). Israel Exploration Society, Jerusalem.
- Glock, A.E. 1985. Tradition and Change in Two Archaeologies. *American Antiquity* 50: 464–477.
- Glueck, N. 1959. *Rivers in the Desert*. Jewish Publication Society, Philadelphia.
- Goedicke, H. 1966. Considerations on the Battle of Qadesh. *The Journal of Egyptian Archaeology* 52: 71–80.
- Goldberg, P. 1984. Late Quaternary History of Qadesh Barnea, Northeast Sinai. *Zeitschrift für Geomorphologie* 28: 193–217.
- Goldberg, P. 1986. Late Quaternary Environmental History of the Southern Levant. *Geoarchaeology* 1: 225–244.
- Goldberg, P. 1987. The Geology and Stratigraphy of Shiqmim. Pp. 35–44 in *Shiqmim I: Prehistoric Investigations of Early Farming Communities in the Negev*. Levy, T.E. (ed.). British Archaeological Reports International 356, Oxford.
- Goldberg, P. 1994. Interpreting Late Quaternary Continental Sequences in Israel. Pp. 89–102 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Bar-Yosef, O. and Kra, R.S. (eds.). University of Arizona and Radiocarbon, Tucson.
- Goldberg, P. and Bar-Yosef, O. 1982. Environmental and Archaeological Evidence for Climatic Change in the Southern Levant. Pp. 399–414 in *Paleoclimates, Paleoenvironments, and Human Communities in the Eastern Mediterranean in Later Prehistory*. Bintliff, J. and Van Zeist, W. (eds.). British Archaeological Reports International Series 133, Oxford.
- Goldberg, P. and Rosen, A.M. 1987. Early Holocene Paleoenvironments of Israel. Pp. 23–33 in *Shiqmim I, Studies Concerning Chalcolithic Societies in the Northern Negev Desert, Israel (1982–1984)*. Levy, T.E. (ed.). British Archaeological Reports International 356, Oxford.

- Golden, J. 2010. *Dawn of the Metal Age: Technology and Society during the Levantine Chalcolithic*. Equinox, London.
- Goldschmidt, W. 1979. A General Model for Pastoral Social Systems. Pp. 15–28 in *Pastoral Production and Society*. Equipe Ecologie et Anthropologie des Sociétés Pastorales, Cambridge University, Cambridge.
- Goodfriend, G.A. 1987. Chronostratigraphic Studies of Sediments in the Negev Desert Using Amino Acid Epimerization Analysis of Land Snail Shells. *Quaternary Research* 28: 374–392.
- Goodfriend, G.A. 1988. Mid-Holocene Rainfall in the Negev Desert from ^{13}C of Land Snail Shell Organic Matter. *Nature* 333: 757–760.
- Goodfriend, G.A. 1990. Rainfall in the Negev Desert during the Middle Holocene, Based on ^{13}C of Organic Matter in Land Snail Shells. *Quaternary Research* 34: 186–197.
- Goodfriend, G.A. 1991. Holocene Trends in ^{18}O in Land Snail Shells from the Negev Desert and Their Implications for Changes in Rainfall Source Areas. *Quaternary Research* 35: 417–426.
- Goodfriend, G.A., Magaritz, M., and Carmi, I. 1986. A High Stand of the Dead Sea at the End of the Neolithic Period: Paleoclimatic and Archaeological Implications. *Climatic Change* 9: 349–356.
- Gopher, A. 1989a. Neolithic Arrowheads of the Levant: Results and Implications of a Seriation Analysis. *Paléorient* 15: 43–56.
- Gopher, A. 1989b. Diffusion Process in the Pre-Pottery Neolithic Levant: The Case of the Helwan Point. Pp. 91–105 in *People and Culture in Change*. Hershkovitz, I. (ed.). British Archaeological Reports International 508, Oxford.
- Gopher, A. 1994. *Arrowheads of the Neolithic Levant*. Eisenbraun, Winona Lake.
- Gopher, A. 2010. Qadesh Barnea 3, a Neolithic Site in the Western Negev Highlands: A Report. *Journal of the Israel Prehistoric Society* 40: 183–218.
- Gopher, A. and Gophna, R. 1993. Cultures of the Eighth and Seventh Millennia B.P. in the Southern Levant: A Review for the 1990s. *Journal of World Prehistory* 7: 297–353.
- Goren, Y. 1999. On Determining Use of Pastoral Cave Sites: A Critical Assessment of Spherulites in Archaeology. *Journal of the Israel Prehistoric Society* 29: 123–128.
- Goren, Y. and Fabian, P. 2008. The Oboda Potter's Workshop Reconsidered. *Journal of Roman Archaeology* 21: 340–351.
- Goren-Inbar, N. 1993. Ethnoarchaeology: The South Sinai Bedouin as a Case Study. Pp. 417–419 in *Biblical Archaeology Today 1990*. Biran, A. and Aviram, J. (eds.). Israel Exploration Society, Jerusalem.
- Goring-Morris, A.N. 1987. *At the Edge: Terminal Pleistocene Hunter-Gatherers*

- in the Negev and Sinai. British Archaeological Reports International 361, Oxford.
- Goring-Morris, A.N. 1993. From Foraging to Herding in the Negev and Sinai: The Early to Late Neolithic Transition. *Paléorient* 19: 65–89.
- Goring-Morris, A.N. 2005. Life, Death and the Emergence of Differential Status in the Near Eastern Neolithic: Evidence from Kfar HaHoresh, Lower Galilee, Israel. Pp. 89–105 in *Archaeological Perspectives on the Transmission and Transformation of Culture in the Eastern Mediterranean*. Clarke, J. (ed.). Council for British Research in the Levant and Oxbow Books, Oxford.
- Goring-Morris, A.N. and Belfer-Cohen, A. 2008. A Roof Over One's Head: Developments in Near Eastern Residential Architecture across the Epipalaeolithic-Neolithic Transition. Pp. 239–286 in *The Neolithic Demographic Transition and Its Consequences*. Bocquet-Appel, J.P. and Bar-Yosef, O. (eds.). Springer, Berlin.
- Goring-Morris, A.N. and Belfer-Cohen, A. 2010. 'Great Expectations,' or the Inevitable Collapse of the Early Neolithic in the Near East. Pp. 62–80 in *Becoming Villages: Comparing Early Village Societies*. Bandy, M.S. and Fox, J.R. (eds.). University of Arizona Press, Tucson.
- Goring-Morris, A.N. and Goldberg, P. 1990. Late Quaternary Dune Incursions in the Southern Levant: Archaeology, Chronology and Palaeoenvironments. *Quaternary International* 5: 115–137.
- Goring-Morris, A.N. and Gopher, A. 1983. Nahal Issaron: A Neolithic Settlement in the Southern Negev. *Israel Exploration Journal* 33: 149–162.
- Goring-Morris, A.N., Gopher, A., and Rosen, S.A. 1994. The Tuwailan Cortical Knife Industry of the Negev, Israel. Pp. 511–524 in *Neolithic Chipped Stone Industries of the Fertile Crescent*. Gebel, H.G. and Kozlowski, S.K. (eds.). Studies in Early Near Eastern Production, Subsistence, and Environment I, Ex Oriente, Berlin.
- Goring-Morris, A.N. and Rosen, S.A. 1987. *Appendix 2; Se Attachment a—Prehistoric Archaeology, in Nuclear Power-Plant—Shivta, a Site Preliminary Safety Analysis Reports Late Cenozoic Geology in the Site Area*. Israel Electric Corporation, Tel Aviv.
- Goring-Morris, A. N, and Rosen, S.A. 1986. Final Report to TAHAL on the Results of the Prehistoric Conducted by the Archaeological Survey of Israel and Other Projects Within 25 Km of the Site. Israel Electric Corporation, Tel Aviv.
- Gošić, M. 2008. Chalcolithic Metallurgy of the Southern Levant: Production Centers and Social Context. *Journal of the Serbian Archaeological Society* 24: 67–80.
- Gottwald, N.K. 1979. *The Tribes of Yahweh: A Sociology of the Religion of*

- Liberated Israel 1250–1050 B.C.E.* Orbis Books, Maryknoll, NY.
- Gould, R.A. ed. 1978. *Explorations in Ethnoarchaeology*. School of American Research, University of New Mexico Press, Albuquerque.
- Gould, R.A. 1980. *Living Archaeology*. Cambridge University, Cambridge.
- Gould, R.A. and Watson, P.J. 1982. A Dialogue on the Meaning and Use of Analogy in Ethnoarchaeological Reasoning. *Journal of Anthropological Archaeology* 1: 355–381.
- Graf, D.F. 1990. The Origins of the Nabateans. *ARAM* 2: 45–75.
- Greenfield, H.J. 1988. The Origins of Milk and Wool Production in the Old World: A Zooarchaeological Perspective from the Central Balkans. *Current Anthropology* 29: 573–593.
- Greenhut, Z. 1989. Flint Tools. Pp. 60–77 in *Excavations in the Judean Desert*. Bar-Adon, P. (ed.). *Atiqot* Vol. 9.
- Grigg, D.B. 1974. *The Agricultural Systems of the World: An Evolutionary Approach*. Cambridge University, Cambridge.
- Grigson, C. 1993. The Earliest Domestic Horses in the Levant?—New Finds from the Fourth Millennium of the Negev. *Journal of Archaeological Science* 20: 645–655.
- Grigson, C. 2012. Camels, Copper and Donkeys in the Early Iron Age of the Southern Levant: Timna Revisited. *Levant* 44: 82–100.
- Groman-Yaroslavski, I. and Bar-Yosef Mayer, D.E. 2015. Lapidary Technology Revealed by Functional Analysis of Carnelian Beads from the Early Neolithic Site of Nahal Hemar Cave, Southern Levant. *Journal of Archaeological Science* 58: 77–88.
- Grosman, L., Munro, N.D., and Belfer-Cohen, A. 2008. A 12,000-Year-Old Shaman Burial from the Southern Levant (Israel). *Proceedings of the National Academy of Science*.
www.pnas.org/cgi_doi_10.1073_pnas.0806030105.
- Gurova, M. 2013. Tribulum Inserts in the Ethnographic and Archaeological Perspective: Case Studies from Bulgaria and Israel. *Lithic Technology* 38: 179–201.
- Haiman, M. 1989. Preliminary Report of the Western Negev Highlands Emergency Survey. *Israel Exploration Journal* 39: 173–191.
- Haiman, M. 1992a. Cairn Burials and Cairn Fields in the Negev. *Bulletin of the American Schools of Oriental Research* 287: 25–46.
- Haiman, M. 1992b. Sedentism and Pastoralism in the Negev Highlands in the Early Bronze Age: Results of the Western Negev Highlands Emergency Survey. Pp. 93–105 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Haiman, M. 1995. Agriculture and Nomad-State Relations in the Negev Desert

- in the Byzantine and Early Islamic Periods. *Bulletin of the American Schools of Oriental Research* 297: 29–54.
- Haiman, M. 1996. Early Bronze Age IV Settlement Pattern of the Negev and Sinai Deserts: View from Small Marginal Temporary Sites. *Bulletin of the American Schools of Oriental Research* 303: 1–32.
- Haiman, M. 2014. A Synthesis of the Early Bronze Age II in the Negev and Sinai. Pp. 245–260 in *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. Saidel, B.A. and Haiman, M. (eds.). British Archaeological Reports International 2684, Archaeopress, Oxford.
- Haiman, M. and Goren, Y. 1992. ‘Negbite’ Pottery: New Aspects and Interpretations and the Role of Pastoralism in Designating Ceramic Technology. Pp. 143–152 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Haimi, Y. and Rosen, S.A. 2011. The Organization of Space at the Camel Site. Pp. 167–198 in *An Investigation into Early Desert Pastoralism, Excavations at the Camel Site*. Rosen, S.A. (ed.). Cotsen Institute of Archaeology at UCLA Monograph 69, Los Angeles.
- Hammer, E. 2014. Local Landscape Organization of Mobile Pastoralists in Southeastern Turkey. *Journal of Anthropological Archaeology* 35: 269–288.
- Hammond, P. 1973. *The Nabataeans—Their History, Culture and Archaeology*. Studies in Mediterranean Archaeology 37, Åström, Göteborg.
- Hassan, F.A. 1979. Demography and Archaeology. *Annual Review of Anthropology* 8: 137–160.
- Hassan, F.A. 1981. *Demographic Archaeology*. Academic Press, New York.
- Hauptmann, A. 2000. *Zur frühen Metallurgie des Kupfers in Fenan/Jordanien*. Der Anschnitt Beiheft 11, Deutsches Bergbau-Museum, Bochum.
- Hauptmann, A., Khalil, L., and Schmitt-Strecker, S. 2009. Evidence of Late Chalcolithic/Early Bronze Age I Copper Production from Timna Ores at Tall al-Magaşş, ‘Aqaba. Pp. 295–304 in *Prehistoric ‘Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23, Mari Leidorf, Rahden.
- Hauptmann, A., Schmitt-Strecker, S., Levy, T.E., and Begemann, F. 2015. On Early Bronze Age Copper Bar Ingots from the Southern Levant. *Bulletin of the American Schools of Oriental Research* 373: 1–24.
- Hauptmann, A. and Weisgerber, G. 1992. Periods of Ore Exploitation and Metal Production in the Area of Feinan, Wadi ‘Arabah, Jordan. *Studies in the History and Archaeology of Jordan* 4: 61–66.
- Headland, T. and Reid, L. 1989. Hunter-Gatherers and Their Neighbors from Prehistory to the Present. *Current Anthropology* 30: 43–66.

- Healey, J.F. 1989. Were the Nabateans Arabs? *ARAM* 1: 38–44.
- Heemeier, B., Rauen, A., Waldhör, M., and Grottker, M. 2009. Water Management at Tall Ḥujayrāt al-Ghuzlān. Pp. 247–272 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). *Orient-Archäologie*, Band 23, Mari Leidorf, Rahden.
- Heide, M. 2010. The Domestication of the Camel: Biological, Archaeological and Inscriptional Evidence from Mesopotamia, Egypt, Israel and Arabia, and Literary Evidence from the Hebrew Bible. *Ugarit Forschungen* 42: 331–384.
- Helmer, D., Gourichon, L., and Vila, E. 2007. The Development of the Exploitation of Products from Capra and Ovis (Meat, Milk and Fleece) from the PPNB to the Early Bronze in the Northern Near East (8700 to 2000 BC cal.). *Anthropozoologica* 42: 41–69.
- Helms, J. 1981. *Lost City of the Black Desert*. Methuen, London.
- Helms, S.W. 1987. Jawa, Tell Um Hammad and the EBI/Late Chalcolithic Landscape. *Levant* 19: 49–82.
- Helms, S.W. 1991. Other Finds. Pp. 154–167 in *Excavations at Jawa 1972–1986*. Betts, A.V.G. (ed.). Edinburgh University, Edinburgh.
- Helms, S.W. and Betts, A.V.G. 1987. The Desert 'Kites' of the Badiyat Esh-Shaur and North Arabia. *Paléorient* 13: 41–67.
- Henry, D.O. 1989. *From Foraging to Agriculture: The Levant at the End of the Ice Age*. University of Pennsylvania, Philadelphia.
- Henry, D.O. 1992. Seasonal Movements of Fourth Millennium Pastoral Nomads in Wadi Hisma. *Studies in the History and Archaeology of Jordan* 4: 137–141.
- Henry, D.O. 1995. *Prehistoric Cultural Ecology and Evolution: Insights from Southern Jordan*. Plenum, New York.
- Henry, D.O. and Beaver, J.E. eds. 2014. *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Ex Orient, Berlin.
- Henry, D.O., Nowell, A., Mendez, K., Peterson, E., Senn, M., and Rockwell, H. 2014. The Technotypology of Chipped Stone Artifacts. Pp. 145–170 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- Henry, D.O. and Turnbull, P. 1985. Archaeological and Faunal Evidence from Natufian and Timnian Sites in Southern Jordan with Notes on Pollen Evidence. *Bulletin of the American Schools of Oriental Research* 257: 45–64.
- Herling, L. 2002a. The Lithic Artefacts from Tall Ḥujayrāt al-Ghuzan. *Orient-Archäologie* 5: 257–269.
- Herling, L. 2002b. The Lithic Artefacts from Tall al-Magaşş. *Orient-Archäologie* 5: 217–331.
- Hermon, S. 2008. *Socio-Economic Aspects of Chalcolithic (4500–3500 BC)*

- Societies in the Southern Levant a Lithic Perspective*. British Archaeological Reports International 1744, Oxford.
- Herman, S., Vardi, J., and Rosen, S.A. 2011. The Lithic Assemblage from the Camel Site. Pp. 81–109 in *An Investigation into Early Desert Pastoralism: Excavations at the Camel Site, Negev*. Rosen, S.A. (ed.). Cotsen Institute of Archaeology at UCLA Monograph 69, Los Angeles.
- Herodotus. *The History of Herodotus*. <http://classics.mit.edu/Herodotus/history.html>.
- Hershkovitz, I., Arbel, G., Bar-Yosef, O., and Goren, A. 1985. The Relationship between Nawamis Entrance Orientations and Sunset Direction. *Tel Aviv* 12: 204–211.
- Hershkovitz, I., Arensburg, B., and Bar-Yosef, O. 1994. The Pre-Pottery Neolithic Populations of South Sinai and Their Relations to Other Circum-Mediterranean Groups: An Anthropological Study. *Paléorient* 20: 59–84.
- Hershkovitz, I., Ben-David, Y. (Kobyliansky), Arensburg, B., Goren, A., and Pinchasov, A. 1987. Rock Engravings in Southern Sinai. Pp. 605–616 in *Sinai—Human Geography*. Gvirtzman, G., Shmueli, A., Gradus, Y. and Beit-Arieh, I. (eds.). Ministry of Defence, Tel Aviv. (Hebrew).
- Hesse, B. 1978. *Evidence for Husbandry from the Early Neolithic Site of Ganj Dareh in Western Iran*. Doctoral dissertation, Columbia University, University Microfilms International, Ann Arbor.
- Hesse, B. 1982. Slaughter Patterns and Domestication: The Beginnings of Pastoralism in Western Iran. *Man* 17: 403–417.
- Hesse, B. and Wapnish, P. 1985. *Animal Bone Archeology*. Manuals on Archeology 5. Smithsonian Institution, Washington.
- Heyd, U. 1960. *Ottoman Documents in Palestine 1552 – 1615*. Oxford University, Oxford.
- Hiatt, J. 1989. State Formation and the Incorporation of Nomads: Local Change and Continuity among Jordanian Bedouin. Pp. 65–80 in *Political Anthropology 7, Outwitting the State*. Skalník, P. (ed.). Transaction, New Brunswick, NJ.
- Hikade, T. 2009. The Lithic Industry at Tall Ḥujayrāt al-Ghuzlān—Campaigns 2000–2003. Pp. 233–246 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23. Mari Leidorf, Rahden.
- Hjort, A. 1981. A Critique of 'Ecological' Models of Pastoral Land Use. *Ethnos* 46: 3–4, 171–189.
- Hoch, E. 1979. Reflections on Prehistoric Life at Umm an-Nar (Trucial Oman) based on Faunal Remains from the Third Millennium BC. Pp. 589–638 in Taddei, M. (ed.). *South Asian Archaeology 1977*. Istituto Universitario Orientale, Naples.
- Hodder, I. 2006. *The Leopard's Tale: Revealing the Secrets of Catal Hoyuk*.

Thames and Hudson, London.

- Hoffmeier, J.K. 2012. Sinai in Egyptian, Levantine and Hebrew (Biblical) Perspectives. Pp. 105–124 in *History of the Peoples of the Eastern Desert*. Barnard, H. and Duistermaat, K. (eds.). Cotsen Institute of Archaeology Monograph 73, UCLA, Los Angeles.
- Hofstadter, D. 1986. *Gödel, Escher, Bach: An Eternal Golden Braid*. Penguin, London.
- Hole, F. 1974. Tepe Tūlā'ī: An Early Campsite in Khuzistan, Iran. *Paléorient* 2: 219–242.
- Hole, F. 1978. Pastoral Nomadism in Western Iran. Pp. 127–168 in *Explorations in Ethnoarchaeology*. Gould, R.A. (ed.). School of American Research, University of New Mexico Press, Albuquerque.
- Hole, F. 2007. Climate of the Past Agricultural Sustainability in the Semi-Arid Near East. *Climates of the Past* 3: 193–203.
- Holzer, A., Avner, U., Porat, N., and Horwitz, L.K. 2010. Desert Kites in the Negev Desert and Northeast Sinai: Their Function, Chronology and Ecology. *Journal of Arid Environments* 74: 806–817.
- Hooijer, D.A. 1961. The Fossil Vertebrates of Ksâr 'Akil, a Palaeolithic Rock Shelter in the Lebanon. *Zoologische Verhandelingen* 49: 1–68.
- Hopkins, D.C. 1993. Pastoralists in Late Bronze Age Palestine: Which Way Did They Go? *The Biblical Archaeologist* 56: 200–211.
- Horowitz, A. 1976. Late Quaternary Paleoenvironments of Prehistoric Settlements. Pp. 57–68 in *Prehistory and Paleoenvironments in the Central Negev, Israel*. Vol. 1. Marks, A.E. (ed.). Southern Methodist University, Dallas.
- Horowitz, A. 1977. Pollen Spectra from Two Early Holocene Prehistoric Sites in the Har Harif (West Central Negev). Pp. 323–326 in *Prehistory and Paleoenvironments in the Central Negev, Israel*. Vol. 2. Marks, A.E. (ed.). Southern Methodist University, Dallas.
- Horowitz, A. 1979. *The Quaternary of Israel*. Academic Press, New York.
- Horwitz, L.K. 2003a. Temporal and Spatial Variation in Neolithic Caprine Exploitation Strategies: A Case Study of Fauna from the Site of Yiftah'el (Israel). *Paléorient* 29: 19–58.
- Horwitz, L.K. 2003b. Early Bronze Age Archaeozoological Remains. Pp. 242–256 in *Archaeology of Sinai: The Ophir Expedition*. Beit-Arieh, I. (ed.). Tel Aviv University Yass Publications in Archaeology 21, Tel Aviv.
- Horwitz, L.K. 2014. Early Bronze Age Fauna from Three Sites in the Negev Highlands. Pp. 191–205 in *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. Saidel, B. and Haiman, M. (eds.). British Archaeological Reports International 2684, Archaeopress, Oxford.
- Horwitz, L.K. and Ducos, P. 2005. Counting Cattle: Trends in Neolithic *Bos*

- Frequencies from the Southern Levant. *Revue de Paléobiologie* 10: 209–224.
- Horwitz, L.K., Rosen, S.A., and Bocquentin, F. 2011. A Late Neolithic Equid Offering from the Mortuary-Cult Site of Ramat Saharonim in the Central Negev. *Journal of the Israel Prehistoric Society* 41: 71–82.
- Horwitz, L.K. and Tchernov, E. 1989. Animal Exploitation in the Early Bronze Age of the Southern Levant: An Overview. Pp. 279–96 in *L'urbanisation de la Palestine à l'âge du Bronze ancien*. de Miroshedji, P. (ed.). British Archaeological Reports International 527, Oxford.
- Horwitz, L.K., Tchernov, E., Ducos, P., Becker, C., Von Den Driesch, A., Martin, L., and Garrard, A. 1999. Animal Domestication in the Southern Levant. *Paléorient* 25: 63–80.
- Horwitz, L.K., Tchernov, E., and Mienis, H. Faunal Remains from Nahal Oded. 1997. Pp. 107–8 in *The 'Oded Sites: Investigations of Two Early Islamic Pastoral Camps South of the Ramon Crater*. Rosen, S.A. and Avi, G. (eds.). Beersheva XI, Ben-Gurion University Press, Beersheva.
- Hourani, F. and Courty, M.A. 1997. L'évolution morpho-climatique de 10500 à 5500 BP dans la vallée du Jourdain. *Paléorient* 23: 95–106.
- Howarth, A. and Koff, D. (Producers). 1976. *People of the Wind*. Elizabeth E. Rogers Productions, Chatsworth, CA.
- Hume, I.N. 1964. Archaeology: Handmaiden to History. *The North Carolina Historical Review* 41: 214–225.
- Hunt, A.M.W. 2015. *Palace Ware across the Neo-Assyrian Imperial Landscape*. Brill, Leiden.
- Hunt, C.O., Elrishi, H.A., Gilbertson, D.D., Grattan, J., McLaren, S., Pyatt, F.B., Rushworth, G., and Barker, G.A.W. 2004. Early-Holocene Environments in the Wadi Faynan, Jordan. *The Holocene* 14: 921–930.
- Hütteroth, W. 1990. Villages and Tribes of the Gezira Under Early Ottoman Administration (16th Century). A Preliminary Report. *Berytus* 38: 179–184.
- Ibn Khaldûn. 1967. *An Introduction to History: The Muqaddimah*. Routledge, London.
- Ilan, O. and Sebbane, M. 1989. Copper Metallurgy, Trade and the Urbanization of Southern Canaan in the Chalcolithic and Early Bronze Age. Pp. 139–162 in *L'urbanisation de la Palestine à l'âge du Bronze ancien*. de Miroshedji, P. (ed.). British Archaeological Reports International 527, Oxford.
- Ingold, T. 1980. *Hunters, Pastoralists and Ranchers*. Cambridge University, Cambridge.
- Ingold, T. 1987. *The Appropriation of Nature: Essays in Human Ecology and Social Relations*. University of Iowa, Iowa City.
- Israel, Y.M. 2006. *The Black Gaza Ware from the Ottoman Period*. Unpublished doctoral dissertation, Ben Gurion University, Beersheva. (Hebrew).
- Issar, A. 1995. Climatic Change and History of the Middle East. *American*

- Issar, A. 1998. Climate Change and History during the Holocene in the Eastern Mediterranean Region. Pp. 113–128 in *Water, Environment, and Society in Times of Climatic Change*. Issar, I. and Brown, N. (eds.). Kluwer, Dordrecht.
- Issar, A. and Govrin, Y. 1991. Climatic Changes and the Desertification of the Negev at the End of the Byzantine Period. *Katedra* 61: 67–81 (Hebrew).
- Issar, A., Govrin, Y., Geyh, M.E., Wakshal, E., and Wolf, M. 1991. Climatic Changes during the Upper Holocene in Israel. *Israel Journal of Earth Sciences* 40: 219–223.
- Jabbur, J.S. 1995. *The Bedouins and the Desert: Aspects of Nomadic Life in the Arab East*. State University of New York, Albany.
- Jackson, J.W. 1962. Report on the Animal Remains Found at Auja. P. 70 in *Excavations at Nessana*. Vol. 1. Colt, H.D. (ed.). Colt Institute, London.
- Jacobson-Tepfer, E. 2012. The Image of the Wheeled Vehicle in the Mongolian Altai: Instability and Ambiguity. *The Silk Road* 10: 1–28.
- Jarvis, C.S. 1931. *Yesterday and Today in Sinai*. Blackwood, London.
- Jenkins, E. and Rosen, A. 2007. The Phytoliths. Pp. 429–436 in *The Early Prehistory of Wadi Faynan, Southern Jordan: Archaeological Survey of Wadis Faynan, Ghuwayr and al-Bustan and Evaluation of the Pre-Pottery Neolithic a Site of WF16*. Finlayson, B. and Mithen, S. (eds.). Oxbow Books, Oxford.
- Joffe, A.H. 1993. *Settlement and Society in the Early Bronze I and II in the Southern Levant*. Sheffield Academic Press, Sheffield.
- Joffe, A.H. 2002. The Rise of Secondary States in the Iron Age Levant. *Journal of the Economic and Social History of the Orient* 45: 425–467.
- Johnson, D.L. 1969. *The Nature of Nomadism: A Comparative Study of Pastoral Migrations in Southwestern Asia and Northern Africa*. University of Chicago Dept. of Geography Research Paper 118, Chicago.
- Johnson, D.L. 1973. *Jabal al-Akhdar Cyrenaica*. University of Chicago Dept. of Geography Research Paper 148, Chicago.
- Johnson, D.L. 1978. Nomadic Organization of Space: Reflections on Patterns and Process. Pp. 25–47 in *Dimensions of Human Geography*. Butzer, K.W. (ed.). University Dept. of Geography Research Paper 186, Chicago.
- Juli, H. 1979. *Ancient Herders of the Negev: A Study in Pastoral Archaeology*. Doctoral Dissertation, Brown University, University Microfilms, Ann Arbor.
- Kadowaki, S. 2006. Ground Stone Tools and Implications for Use of Space and Social Relations at Ayn Abu Nukhayla, a PPNB Settlement in Southern Jordan. Pp. 53–64 in *Domesticating Space: Construction, Community, and Cosmology in the Late Prehistoric Near East*. Banning, E.B. and Chazan, M. (eds.). Studies in Early Near Eastern Production, Subsistence and

Environment 6, Ex Oriente, Berlin.

- Kadowaki, S. 2014. Groundstones and Grinding Technology. Pp 259–286 in *The Sands of Time. The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- Kadwell, M., Fernandez, M., Stanley, H.F., Baldi, R., Wheeler, J.C., Rosadio, R., and Bru-ford, M.W. 2001. Genetic Analysis Reveals the Wild Ancestors of the Llama and the Alpaca. *Proceedings of the Royal Society of London B* 268: 2575–2584.
- Kahila Bar-Gal, G., Ducos, P., and Horwitz, L.K. 2003. The Application of Ancient DNA Analysis to Identify Neolithic Caprinae: A Case Study from the Site of Hatoula, Israel. *International Journal of Osteoarchaeology* 13: 120–131.
- Kahila Bar-Gal, G., Khalaily, H., Marder, O., Ducos, P., and Horwitz, L.K. 2002. Ancient DNA Evidence for the Transition from Wild to Domestic Status in Neolithic Goats: A Case Study from the Site of Abu Gosh, Israel. *Ancient Biomolecules* 4: 9–17.
- Kamp, K.A. and Yoffee, N. 1980. Ethnicity in Ancient Western Asia during the Early Second Millennium B.C.: Archaeological Assessments and Ethnoarchaeological Prospectives. *Bulletin of the American Schools of Oriental Research* 237: 85–104.
- Kaplan, A. 1998 [1964]. *The Conduct of Inquiry: Methodology for Behavioral Science*. Transaction, New Brunswick.
- Kaplan, J. 1954. Two Chalcolithic Vessels from Palestine. *Palestine Exploration Quarterly* 86: 97–100.
- Katz, O., Gilead, I., Bar (Kutiel), P., and Shahack-Gross, R. 2007. Chalcolithic Agricultural Life at the Site of Grar, Northern Negev, Israel: Dry Farmed Cereals and Dung-Fueled Hearths. *Paléorient* 33: 101–116.
- Kedar, Y. 1967. *Ancient Agriculture in the Negev Highlands*. Bialik Institute, Jerusalem.
- Keenan, J. 1977. Power and Wealth Are Cousins: Descent, Class and Marital Strategies among the Kel Ahaggar (Tuareg—Sahara). *Africa* 47: 242–252.
- Kelly, K. 1986. *Navajo Land Use: An Ethnoarchaeological Study*. Academic, Orlando.
- Kempinski, A. 1989. Urbanization and Metallurgy in Southern Canaan. Pp. 163–68 in *L'urbanisation de la Palestine à l'âge du Bronze ancien*. de Miroschedji, P. (ed.). British Archaeological Reports International 527, Oxford.
- Kennedy, D. 2012. Kites—New Discoveries and a New Type. *Arabian Archaeology and Epigraphy* 23: 145–155.
- Kent, S. ed. 1989. *Farmers as Hunters: The Implications of Sedentism*. Cambridge University, Cambridge.

- Kenyon, K.M. 1957. *Digging Up Jericho*. Praeger, New York.
- Kenyon, K.M. 1980. *Archaeology in the Holy Land*. Benn Norton, London.
- Kerner, S. 2009. The Pottery of Tall Hujayrāt al-Ghuzlān 2000–2004. Pp. 127–232 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie: Band 23. Mari Leidorf, Rahden.
- Key, C.A. 1980. The Trace Element Composition of the Copper Alloy Artifacts of the Nahal Mishmar Hoard. Pp. 238–243 in *The Cave of the Treasure*. Bar-Adon, P. (ed.). Israel Exploration Society, Jerusalem.
- Khalaily, H. 2009. The 'Ghazalian Culture', a Transitional Phase from Pre-Pottery to the Early Pottery Neolithic Periods: Technological Innovation and Economic Adaptation. Pp. 179–191 in *Techniques and People*. Rosen, S.A. and Roux, V. (eds.). De Boccard, Paris.
- Khalil, L. 2009. The Excavations at Tall al-Magaşş. Pp. 5–16 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23. Mari Leidorf, Rahden.
- Khalil, L. and Schmidt, K. eds. 2009. *Prehistoric 'Aqaba I: Prehistoric 'Aqaba I*. Orient Archäologie, Band 23. Mari Leidorf, Rahden.
- Khazanov, A.M. 1984. *Nomads and the Outside World*. Cambridge University, Cambridge.
- Khazanov, A.M. 2003. Nomads of the Eurasian Steppes in Historical Retrospective. Pp. 25–49 in *Nomadic Pathways in Social Evolution*. Kradin, N.N., Bondarenko, D.M., and Barfield, T.J. (eds.). Russian Academy of Sciences, Moscow.
- Khazanov, A.M. 2005. Nomads and Cities in the Eurasian Steppe Region and Adjacent Countries: An Historical Overview. Pp. 163–178 in *Shifts and Drifts in Nomad-Sedentary Relations*. Leder, S. and Streck, B. (eds.). Reichert, Wiesbaden.
- Kinnes, I. 1982. Les Fouaillages and Megalithic Origins. *Antiquity* 56: 24–30.
- Kirk, G.E. 1941. The Negev, or Southern Desert of Palestine. *Palestine Exploration Quarterly* 194: 57–71.
- Kirkbride, D. 1966. Five Seasons at the Pre-Pottery Neolithic Village of Beidha in Jordan. *Palestine Exploration Quarterly* 98: 8–72.
- Kislev, M.E. 1987. Chalcolithic Plant Husbandry and Ancient Vegetation at Shiqmim. Pp. 251–279 in *Shiqmim I, Studies Concerning Chalcolithic Societies in the Northern Negev Desert, Israel*. Levy, T.E. (ed.). British Archaeological Reports International 356(i), Oxford.
- Kitchen, K.A. 1964. Some New Light on the Asiatic Wars of Ramesses II. *The Journal of Egyptian Archaeology* 50: 47–70.
- Kitchen, K.A. 1972. Review of Givon, R. *Les Bedouins Shosou des documents Egyptiens*. *The Journal of Egyptian Archaeology* 58: 322–323.
- Kitchen, K.A. 1994. Review of Redford, D.B. 1990: Egypt and Canaan in the New Kingdom. *The Journal of Egyptian Archaeology* 80: 242–243.

- Klein, R.G. and Cruz-Urbe, K. 1984. *The Analysis of Animal Bones from Archeological Sites*. University of Chicago, Chicago.
- Klimscha, F. 2011. Long-Range Contacts in the Late Chalcolithic of the Southern Levant: Excavations at Tall Hujayrat al-Ghuzlan and Tall al-Magass Near Aqaba, Jordan. Pp. 177–209 in *Egypt and the Near East—The Crossroads*. Mynářova, J. (ed.). Charles University, Prague.
- Gluckhohn, C. and Leighton, D. 1962. *The Navaho*. Natural History Press, Garden City.
- Kochavi, M. 1967. *The Settlement of the Negev in the Middle Bronze (Canaanite) I Age*. Unpublished doctoral dissertation, Hebrew University, Jerusalem. (Hebrew).
- Köhler-Rollefson, I. 1992. A Model for the Development of Nomadic Pastoralism on the Transjordanian Plateau. Pp. 11–18 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison, WI.
- Köhler-Rollefson, I., Quintero, L., and Rollefson, G. 1993. Brief Note on the Fauna from Neolithic 'Ain Ghazal'. *Paléorient* 19: 95–97.
- Korjenkov, A.M. and Mazor, E. 1998. Seismogenic Origin of the Ancient Avdat Ruins, Negev Desert, Israel. *Natural Hazards* 18: 193–226.
- Kozhin, P.M. 1997. Nomadic Life Factors of the Bronze Age Black Sea Maritime Steppe and the Caspian Maritime Steppe Cultures. Pp. 47–61 in *Steppe and the Caucasus (Cultural Tradition)*. Kozhin, P. (ed.). Papers of the State Historical Museum 97, Domonant, Moscow.
- Kozloff, B. 1973. A Brief Note on the Lithic Industries of Sinai. *Museum Ha'aretz Yearbook* 15/16: 35–49.
- Kozloff, B. 1981. Pastoral Nomadism in Sinai: An Ethnoarchaeological Study. *Production pastorales et société: bulletin d'écologie et d'anthropologie des sociétés pastorales* 8: 19–24.
- Kradin, N. 2002. Nomadism, Evolution and World-Systems: Pastoral Societies in Theories of Historical Development. *Journal of World Systems Research* 8: 368–388.
- Kradin, N. 2008. Early State Theory and the Evolution of Pastoral Nomads. *Social Evolution and History* 7: 107–130.
- Kraemer, C.J. 1958. *Non-Literary Papyri: Excavations at Nessana*. Vol. 3. Princeton University, Princeton.
- Kramer, C. ed. 1979. *Ethnoarchaeology*. Columbia University, New York.
- Kramer, C. 1982. *Village Ethnoarchaeology: Rural Iran in Archaeological Perspective*. Academic, New York.
- Kressel, G. 2003. *Let Shepherding Endure: Applied Anthropology and the Preservation of a Cultural Tradition in Israel and the Middle East*. State

University of New York, New York.

- Kressel, G.M. and Ben-David, J. 1995. The Bedouin Market—Cornerstone for the Founding of Be'er-Sheva: Bedouin Traditions about the Development of the Negev Capital in the Ottoman period. *Nomadic Peoples* 36/37: 119–144.
- Kristiansen, K. 1984. Ideology and Material Culture: An Archaeological Perspective. Pp. 72–100 in *Marxist Perspectives in Archaeology*. Spriggs, M. (ed.). Cambridge University, Cambridge.
- Krolik, H. 1999. Excavations at Sinai-31, the Megrah Site, Tabieq Locality. Pp. 221–253 in *An Archaeological Investigation of the Central Sinai, Egypt*. Eddy, F.W. and Wendorf, F. (eds.). The American Research Center in Egypt and the University of Colorado, Boulder.
- Kuijt, I. and Goring-Morris, N. 2002. Foraging, Farming, and Social Complexity in the Pre-Pottery Neolithic of the Southern Levant: A Review and Synthesis. *Journal of World Prehistory* 16: 361–440.
- Kupper, J.R. 1957. *Les Nomades en Mesopotamie Au Temps Des Rois de Mari*. Bibliotheque de la Faculte de Philosophie et Lettres de L'Universite de Liege, Paris.
- Kuzucuoglu, C., Bertaux, J., Black, S., Deneffe, M., Fontugne, M., Karabiyikolu, M., Kashima, K., Limondin-Lozouet, N., Mouralis, D., and Orth, P. 1999. Reconstruction of Climatic Changes during the Late Pleistocene, based on Sediment Records from the Konya Basin (Central Anatolia, Turkey). *Geological Journal* 34: 175–198.
- Kuzucuoglu, C. and Marro, C. (eds.). 2007. *Societes humaines et changement climatique a la fin du troisieme millenaire: une crise a-t-elle eu lieu en haute Mesopotamie? Varia Anatolica* 19.
- LaBianca, O. 1990. *Sedentarization and Nomadization: Food System Cycles at Hesban and Vicinity in Transjordan: Hesban1*. Andrews University Press, Berrien Springs, MI.
- Lance, H.D. 1978. The Field Recording System. Pp. 73–106 in *A Manual of Field Excavation*. Dever, W.G. and Lance, H.D. (eds.). Hebrew Union College, New York.
- Lane, K. 2006. Through the Looking Glass: Re-Assessing the Role of Agro-Pastoralism in the North-Central Andean Highlands. *World Archaeology* 38: 493–510.
- Langgut, D., Neumann, F.H., Stein, M., Wagner, A., Kagan, E.J., Boaretto, E., and Finkelstein, I. 2014. Dead Sea Pollen Record and History of Human Activity in the Judean Highlands (Israel) from the Intermediate Bronze into the Iron Ages (2500–500 BCE). *Palynology* 38: 280–302.
- Lassányi, G. 2012. On the Archaeology of the Native Population of the Eastern Desert in the First-Seventh Centuries CE. Pp. 248–269 in *History of the Peoples of the Eastern Desert*. Barnard, H. and Duistermaat, K. (eds.).

- Cotsen Institute of Archaeology Monograph 73, UCLA, Los Angeles.
- Lattimore, O. 1962. *Studies in Frontier History: Collected Papers, 1928–1958*. Oxford University, London.
- Lawrence, D., Bradbury, J., and Dunford, R. 2012. Chronology, Uncertainty and GIS: A Methodology for Characterising and Understanding Landscapes of the Ancient Near East. *eTopoi, Journal for Ancient Studies* 3: 353–359.
- Leach, E.R. 1954. *Political Systems of Highland Burma*. Beacon Press, Boston.
- Lechtman, H. and Klein, S. 1999. The Production of Copper-Arsenic Alloys (Arsenic-Bronze) by Cosmelting: Modern Experiment, Ancient Practice. *Journal of Archaeological Science* 26: 497–526.
- Lee, R.B. and DeVore, I. eds. 1968. *Man the Hunter*. Aldine, Chicago.
- Lees, S.H. and Bates, D.G. 1974. The Origins of Specialized Pastoral Nomadism: A Systemic Model. *American Antiquity* 39: 187–193.
- Legge, A.J. 1972. Prehistoric Exploitation of the Gazelle in Palestine. Pp. 119–124 in *Papers in Economic Prehistory*. Higgs, E.S. (ed.). Cambridge University, Cambridge.
- Legge, A.J. and Rowley-Conwy, P. 1987. Gazelle Killing in Stone Age Syria. *Scientific American* 257: 76–83.
- Lehmann, G. 2004. Reconstructing the Social Landscape of Early Israel: Rural Marriage Alliances in the Central Hill Country. *Tel Aviv* 31: 141–193.
- Lehmann, G., Rosen, S.A., Berlejung, A., Neumeier, B.A., and Niemann, H.M. 2010. Excavations at Qubur al-Walaydah, 2007–2009. *Die Welt des Orients* 40: 1–23.
- Leonard, A. Jr. 1989. Archaeological Sources for the History of Palestine: The Late Bronze Age. *The Biblical Archaeologist* 52: 4–39.
- Levine, M.A. 2005. Domestication and Early History of the Horse. Pp. 5–22 in *The Domestic Horse: The Origins, Development and Management of Its Behaviour*. Mills, D.M. and McDonnell, S.M. (eds.). Cambridge University, Cambridge.
- Levy, J. and Gilead, I. 2012. Spinning in the 5th Millennium in the Southern Levant: Aspects of the Textile Economy. *Paléorient* 38: 127–139.
- Levy, T.E. 1983. The Emergence of Specialized Pastoralism in the Southern Levant. *World Archaeology* 15: 15–36.
- Levy, T.E., Adams, R.B., Hauptmann, A., Prange, M., Schmitt-Strecker, S., and Najjar, M. 2002. Early Bronze Age Metallurgy: A Newly Discovered Copper Manufactory in Southern Jordan. *Antiquity* 72: 425–437.
- Levy, T.E., Adams, R.B., and Muniz, A. 2004. Archaeology and the Shasu Nomads: Recent Excavations in the Jabal Hamrat Fidan, Jordan. Pp. 63–89 in *Le-David Maskil: A Birthday Tribute for David Noel Freedman*. Propp, W.H. and Friedman, R.E. (eds.). Biblical and Judaic Studies from the University of California, San Diego, 9, Eisenbrauns, Winona Lake, IN.

- Levy, T.E., Alon, D., Grigson, C., Holl, A., Goldberg, P., Rowan, Y., and Smith, P. 1991. Subterranean Negev Settlement. *National Geographic Research Exploration* 7: 394–413.
- Levy, T.E. and Rosen, S.A. 1987. The Chipped Stone Industry at Shiqmim: Typological Considerations. Pp. 281–294, 564–610 in *Shiqmim I*. Levy, T.E. (ed.). British Archaeological Reports International Series 356, Oxford.
- Levy, T.E., Schneider, T., and Propp, W.H.C. 2013. *Israel's Exodus in Transdisciplinary Perspective*. Springer, New York.
- Levy, T.E. and Shalev, S. 1989. Prehistoric Metalworking in the Southern Levant: Archaeometallurgical and Social Perspectives. *World Archaeology* 20: 352–372.
- Lewis, N.N. 1987. *Nomads and Settlers in Syria and Jordan, 1800–1980*. Cambridge University, Cambridge.
- Lightfoot, E., Motuzaite-Matuzeviciute, G., O'Connell, T.C., Kukushkin, I.A., Loman, V., Varfolomeev, V., Liu, X., and Jones, M.K. 2015. How 'Pastoral' Is Pastoralism? Dietary Diversity in Bronze Age Communities in the Central Kazakhstan Steppes. *Archaeometry* 57(S1): 232–249.
- Lindner, R.P. 1982. What was a nomadic tribe?. *Comparative Studies in Society and History* 24:689–711.
- Lipshchitz, N. 1986. The Vegetational Landscape and the Macroclimate of Israel during Prehistoric and Protohistoric Periods. *Mitkufat Haeven (Journal of the Israel Prehistoric Society)* 19: 80–90.
- Lipshchitz, N., Lev-Yadun, S., and Waisel, Y. 1981. Dendroarchaeological Investigations in Israel (Masada). *Israel Exploration Journal* 31: 230–234.
- Litt, T., Ohlwein, C., Neumann, F.H., Hense, A., and Stein, M. 2012. Holocene Climate Variability in the Levant from the Dead Sea Pollen Record. *Quaternary Science Reviews* 49: 95–105.
- Lorenz, E.N. 1996. *The Essence of Chaos*. University of Washington, Seattle.
- Luke, J.T. 1965. *Pastoralism and Politics in the Mari Period: A Re-Examination of the Character and Political Significance of the Major West Semitic Tribal Groups on the Middle Euphrates, Ca. 1828–1758 B.C.* Doctoral dissertation, University of Michigan, University Micro-films, Ann Arbor.
- Lyell, C. 1837. *Principles of Geology: Being an Inquiry How Far the Former Changes of the Earth's Surface Are Referable to Causes Now in Operation*. Vol. 1. J. Kay, Jun. & Brother, Philadelphia.
- Lyonnet, B. 2009. Who Lived in the Third Millennium 'round cities' of Northern Syria. Pp. 179–200 in *Nomads, Tribes and the State in the Ancient Near East: Cross-Disciplinary Perspectives*. Szuchman, J. (ed.). The Oriental Institute of the University of Chicago Seminar 5, Chicago.
- Macalister, R.M.A. 1912. *The Excavation of Gezer*. Vol. 2. John Murray, London.
- Macdonald, E. 1932. *Beth Peleth II: Prehistoric Fara*. Quaritch, London.

- Magid, A.A. 2008. History of the Nomadic Architecture of the Hadendowa in Northeast Sudan. Pp. 444–464 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminar Series 4, Cotsen Institute of Archaeology, Los Angeles.
- Magness, J. 2003. *The Archaeology of the Early Islamic Settlement in Palestine*. Vol. 1. Eisenbrauns, Winona Lake, IN.
- Makarewicz, C.A. 2013. A Pastoralist Manifesto: Breaking Stereotypes and Re-Conceptualizing Pastoralism in the Near Eastern Neolithic. *Levant* 45: 159–174.
- Makarewicz, C.A. and Tuross, N. 2012. Finding Fodder and Tracking Transhumance: Isotopic Detection of Goat Domestication Processes in the Near East. *Current Anthropology* 53: 495–505.
- Manclossi, F., Rosen, S.A., and de Miroshedji, P. 2016. The Canaanite Blades from Tel Yarmuth: A Technological Analysis. *Paléorient* 42:53-79.
- Marean, C.W., Abe, Y., Nilssen, P.J., and Stone, E.C. 2001. Estimating the Minimum Number of Skeletal Elements (MNE) in Zooarchaeology: A Review and a New Image-Analysis GIS Approach. *American Antiquity* 66: 333–348.
- Marks, A.E. ed. 1976, 1977, 1983. *Prehistory and Paleoenvironments in the Central Negev, Israel*. Vols. 1–3. Southern Methodist University, Dallas.
- Marom, N. 2012. *Animals and Society in the Neolithic Settlement at Sha'ar Hagolan*. Unpublished doctoral dissertation, Department of Archaeology, University of Haifa, Haifa.
- Marshall, F. 1990. Origins of Specialized Pastoral Production in East Africa. *American Anthropologist* 92: 873–894.
- Martin, L. 1999. Mammal Remains from the Eastern Jordanian Neolithic, and the Nature of Caprine Herding in the Steppe. *Paléorient* 25: 87–104.
- Martin, L. and Edwards, Y. 2013. Diverse Strategies: Evaluating the Appearance and Spread of Domestic Caprines in the Southern Levant. Pp. 49–82 in *The Origins and Spread of Domestic Animals in Southwest Asia and Europe*. Colledge, S., Conolly, J., Dobney, K., Manning, K., and Shennan, S. (eds.). Institute of Archaeology Publications 59 (University College London), Left Coast Press, Walnut Creek.
- Martin, P.S. and Klein, R.G. eds. 1984. *Quaternary Extinctions, a Prehistoric Revolution*. University of Arizona, Tucson.
- Marx, E. 1967. *Bedouin of the Negev*. Praeger, New York.
- Marx, E. 1977. The Tribe as a Unit of Subsistence: Nomadic Pastoralism in the Near East. *American Anthropologist* 79: 343–363.
- Marx, E. 1992. Are There Pastoral Nomads in the Middle East? Pp. 255–260 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World

- Marx, E. 2006. The Political Economy of Middle Eastern and North African Pastoral Nomads. Pp. 78–97 in *Nomadic Societies in the Middle East and North Africa: Entering the 21st Century*. Chatty, D. (ed.). Brill, Leiden.
- Matthews, V.H. 1978. *Pastoral Nomadism in the Mari Kingdom (ca. 1830–1760 B.C.)*. American Schools of Oriental Research Dissertation Series 3, American Schools of Oriental Research, Cambridge, MA.
- Mayerson, P. 1960. *The Ancient Agricultural Regime of Nessana and the Central Negev: Excavations at Nessana*. Vol. 1. Colt Institute, London.
- Mayerson, P. 1964. The First Muslim Attacks on Southern Palestine (A.D. 633/634). *Transactions and Proceedings of the American Philological Association* 95: 155–199.
- Mayerson, P. 1975. Observations on the ‘Nilus’ Narrationes: Evidence for an Unknown Christian Sect? *Journal of the American Research Center in Egypt* 12: 51–74.
- Mayerson, P. 1989a. Saracens and Romans: Micro-Macro Relationships. *Bulletin of the American Schools of Oriental Research* 274: 71–79.
- Mayerson, P. 1989b. The Word Saracen (CAPAKHNOC) in the Papyri. *Zeitschrift für Papyrologie und Epigraphik* 79: 283–287.
- Mayerson, P. 1994. *Monks, Martyrs, Soldiers, and Saracens: Papers on the Near East in Late Antiquity (1962–1993)*. Israel Exploration Society, Jerusalem.
- Mayewskia, P.A., Rohling, E.E., Stager, J.C., Karlend, W., Maascha, K.A., Meeker, L.D., Meyerson, E.A., Gasse, F., van Kreveld, S., Holmgren, K., Lee-Thorp, J., Rosqvist, G., Rack, F., Staubwasser, M., Schneider, R.R., and Steig, E.J. 2004. Holocene Climate Variability. *Quaternary Research* 62: 243–255.
- Mazar, A. 1992. The Iron Age I. Pp. 258–301 in *The Archaeology of Ancient Israel*. Ben Tor, A. (ed.). The Open University of Israel and Yale University Press, New Haven.
- McCartney, C.J. 1992. Preliminary Report of the 1989 Excavations at Site 27 of the Burqu^C/Ruweishid Project. *Levant* 24: 33–54.
- McCartney, C.J. and Betts, A.V.G. 1998. Dhuwaila: Chipped Stone. Pp. 59–120 in *The Harra and the Hamad, Excavations and Surveys in Eastern Jordan*. Vol. 1. Betts, A.V.G. (ed.). Sheffield Archaeological Monographs 9, Sheffield.
- McConaughy, M. 1980. Chipped Stone Tools [from Bab edh Dhra]. *Bulletin of the American Schools of Oriental Research* 240: 53–58.
- McCorriston, J. and Ekstrom, H. 2014. Archaeobotanical Remains from Ayn Abu Nukhayla. Pp. 139–144 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- McEwen, E. 1998. The Bow. Pp. 45–53 in *The Cave of the Warrior: A Fourth Millennium Burial in the Judean Desert*. Schick, T. (ed.). Israel Antiquities

- Meadow, R.H. 1989a. Osteoleological Evidence for the Process of Animal Domestication. Pp. 80–90 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation*. Clutton Brock, J. (ed.). Unwin-Hyma, London.
- Meadow, R.H. 1989b. Prehistoric Wild Sheep and Sheep Domestication in the Eastern Margin of the Middle East. Pp. 24–46 in *Early Animal Domestication and Its Cultural Context*. Crabtree, P.J., Campana, D.V., and Ryan, K. (eds.). University of Pennsylvania Museum and MASCA, Philadelphia.
- Meir, A. 1996. Territoriality Among the Negev Bedouin in Transition from Nomadism to Sedentarism. Pp. 188–207 in *The Anthropology of Tribal and Peasant Pastoral Societies: The Dialectics and Social Cohesion and Fragmentation*. Fabietti, U. and Salzman, P.C. (eds.). Ibis, Pavia.
- Meir, A. 1997. *As Nomadism Ends: The Israeli Bedouin of the Negev*. Westview Press, Boulder.
- Meir, A. and Karplus, Y. eds. 2013. *The Construction of Bedouin Space in the Negev*. The Negev Center for Development, Ben-Gurion University, Beersheva. (Hebrew).
- Mellaart, J. 1975. *The Neolithic of the Near East*. Scribners, New York.
- Meraïot, A. 2011. *Contemporary Bedouin Adaptations within the Archaeological Environment of the Ancient Byzantine Town of Avdat in Traditional and Modern Sedentarization Processes in the Negev Highlands*. Unpublished doctoral dissertation, Ben-Gurion University, Beersheva. (Hebrew).
- Meraïot, A. 2013. The Bedouin Adoption and Adaption of Early Remains from the Agricultural Environs of the Byzantine City of Avdat in the Process of Historical Sedentarization. Pp. 252–278 in *The Construction of Bedouin Space in the Negev*. Meir, A. and Karplus, Y. (eds.). The Negev Center for Development, Ben-Gurion University, Beersheva. (Hebrew).
- Merkel, J. and Rothenberg, B. 1999. The Earliest Steps to Copper Metallurgy in the Western Arabah. Pp. 149–166 in *The Beginnings of Metallurgy*. Hauptmann, A., Pernicka, E., Rehren, T., and Yalcin, U. (eds.). Der Anschnitt Beiheft 9, Deutsches Bergbau-Museum, Bochum.
- Meshel, A. and Tsafir, Y. 1975. The Nabatean Road from Avdat to Sha'ar Ramon. *Palestine Exploration Quarterly* 107: 3–21.
- Meshel, Z. 1974. New Data about the 'Desert Kites'. *Tel Aviv* 1: 129–143.
- Migowski, C., Stein, M., Prasad, S., Negendank, J.F.W., and Agnon, A. 2006. Holocene Climate Variability and Cultural Evolution in the Near East from the Dead Sea Sedimentary Record. *Quaternary Research* 66: 421–431.
- Miller, J.J. 1999. Excavations at Sinai-18: The Khasem El Taref Site, Zarnaq

- Locality. Pp. 181–192 in *An Archaeological Investigation of the Central Sinai, Egypt*. Eddy, F.W. and Wendorf, F. (eds.). The American Research Center in Egypt and the University of Colorado, Boulder.
- Misch-Brandl, O. and Saidel, B.A. 2014. Personal Ornaments. In *Excavations in the Western Negev Highlands: Results of the Negev Emergency Survey 1978–89*. Pp. 145–154 in British Archaeological Reports International Series 2684. Saidel, B.A. and Haiman, M. (eds.). Archaeopress, Oxford.
- Mithen, S. 2007. Did Farming Arise from a Misapplication of Social Intelligence? *Philosophical Transactions of the Royal Society B* 362: 705–718.
- Moore, A. 1973. The Late Neolithic in Palestine. *Levant* 5: 36–68.
- Morey, D.F. 1992. Size, Shape, and Development in the Evolution of the Domestic Dog. *Journal of Archaeological Science* 19: 181–204.
- Morgunova, N.L. 1995. *Neolithic and Eneolithic Periods of the South Part of the Forest-Steppe Volga-Ural region*. Yuzhny Ural, Orenburg.
- Müller-Neuhof, B. 2013. Southwest Asian Late Chalcolithic/Early Bronze Age Demand for ‘Big-Tools’: Specialized Flint Exploitation Beyond the Fringes of Settled Regions. *Lithic Technology* 38: 220–236.
- Müller-Neuhof, B. 2014. A ‘Marginal’ Region with Many Options: The Diversity of Chalcolithic/Early Bronze Age Socio-Economic Activities in the Hinterland of Jawa. *Levant* 46: 230–248.
- Muniz, A.A. 2007. *Feeding the Periphery: Modeling Early Bronze Age Economies and the Cultural Landscape of the Faynan District, Southern Jordan*. Unpublished doctoral dissertation, University of California, San Diego.
- Munro, N.D. 2004. Zooarchaeological Measures of Hunting Pressure and Occupation Intensity in the Natufian: Implications for Agricultural Origins. *Current Anthropology* 45(S4): 5–34.
- Murray, G.W. 1935. *The Sons of Ishmael: A Study of the Egyptian Bedouin*. Routledge, London.
- Musil, A. 1908. *Arabia Petraea III*. Hölder, Vienna.
- Musil, A. 1928. *The Manners and Customs of the Rawala Bedouin*. American Geographic Society, Oriental Explorations and Studies 6, New York.
- Na’aman, N. 1986. Ḥabiru and Hebrews: The Transfer of a Social Term to the Literary Sphere. *Journal of Near Eastern Studies* 45: 271–288.
- Naderi, S., Rezaei, H.R., Pompanon, F., Blum, M.G.B., Negrini, R., Naghash, H.R., Balkiz, Ö., Mashkour, M., Gaggiotti, O., Ajmone-Marsan, P., Kence, A., Vigne, J.D., and Taberlet, P. 2008. The Goat Domestication Process Inferred from Large-Scale Mitochondrial DNA Analysis of Wild and Domestic Individuals. *Proceedings of the National Academy of Sciences* 105: 17659–17664.

- Nahlieli, D. 2007. Settlement Patterns in the Late Byzantine and Early Islamic Periods in the Negev, Israel. Pp. 79–86 in *On the Fringe of Society: Archaeological and Ethnoarchaeological Perspectives on Pastoral and Agricultural Societies*. Saidel, B.A. and van der Steen, E. (eds.). British Archaeological Reports International 1657, Oxford.
- Naroll, R. 1962. Floor Area and Settlement Population. *American Antiquity* 27: 587–589.
- Neef, R. 2009. Living in the Desert: Plant Remains from Tall al-Magaşş. Pp. 355–362 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23. Mari Leidorf, Rahden.
- Neev, D. and Emery, K.O. 1967. *The Dead Sea: Depositional Processes and Environments of Evaporites*. Geological Survey of Israel Bulletin 41, Jerusalem.
- Neev, D. and Emery, K.O. 1995. *The Destruction of Sodom, Gomorrah, and Jericho*. Oxford University, Oxford.
- Neev, D. and Hall, J.K. 1977. Climatic Fluctuations during the Holocene as Reflected by Dead Sea Levels. Paper presented at the International Conference on Terminal Lakes, Weber State College, Ogden Utah.
- Negev, A. 1974. *The Nabatean Potter's Workshop at Oboda*. Habelt, Bonn.
- Negev, A. 1983. *Masters of the Desert*. Keter, Jerusalem. (Hebrew).
- Negev, A. 1986. *The Late Hellenistic and Early Roman Pottery of Nabatean Oboda*. Qedem 22, Hebrew University, Jerusalem.
- Nesbitt, M. 2004. Can We Identify a Centre, a Region, or a Supra-Region for Near Eastern Plant Domestication. *Neo-Lithics* 1(4): 38–40.
- Neuville, R. 1930. Notes de Prehistoire Palestinienne. *Journal of the Palestine Oriental Society* 10: 193–221.
- Nevo, Y.D. 1985. *Sede Boqer and the Central Negev in the 7–8th Centuries A.D.* Israel Publication Services, Jerusalem.
- Nevo, Y.D. 1991. *Pagans and Herders*. Israel Publication Services, Jerusalem.
- Nevo, Y.D., Cohen, Z., and Heftman, D. 1993. *Ancient Arabic Inscriptions from the Negev*. Midreshet Ben-Gurion, Sede Boqer, Israel.
- Nevo, Y.D. and Koren, J. 1990. The Origins of the Muslim Descriptions of the Jahili Meccan Sanctuary. *Journal of Near Eastern Studies* 49: 23–44.
- Ngendello, A.M. and Heemskerk, W.C.S. 2004. Pack Donkeys, Bicycles, and Carts: A Case Study from Sukumaland in North-West Tanzania. Pp. 122–126 in *Donkeys, People and Development: A Resource Book of the Animal Traction Network for Eastern and Southern Africa*. Starkey, P. and Fielding, D. (eds.). ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen, Netherlands.
- Nigro, L. 2014. The Copper Route and the Egyptian Connection in 3rd Millennium BC Jordan Seen from the Caravan City of Khirbet al-Batrawy.

- Nol, H. 2015. The Fertile Desert: Agriculture and Copper Industry in Early Islamic Arava (Arabah). *Palestine Exploration Quarterly* 147: 49–68.
- Norris, H.T. 1952. Tuareg Nomadism in the Modern World. *African Affairs* 51: 152–155.
- Nowell, A., Gutzeit, J., Bell, C., and Henry, D.O. 2014. Attribute Studies of Points, Perforators, Knives and Lithic Caches from Ayn Abu Nukhalya. Pp. 171–192 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- Noy, T., Burian, F., and Friedman, E. 1981. Nahal Lavan 108: A Pre-Pottery Neolithic A Site in the Western Negev, Israel. *Palestine Exploration Quarterly* 113: 81–88.
- Oates, J., McMahon, A., Karsgaard, P., al Quntar, S., and Ur, J. 2007. Early Mesopotamian Urbanism: A New View from the North. *Antiquity* 81: 585–600.
- O'Connell, J. 1987. Alyawara Site Structure and Its Archaeological Implications. *American Antiquity* 52: 74–108.
- O'Connell, J.F., Hawkes, K., and Jones, N.B. 1991. Distribution of Refuse-Producing Activities at Hadza Residential Base Camps: Implications for Analyses of Archaeological Site Structures. Pp. 61–76 in *The Interpretation of Archaeological Spatial Patterning*. Kroll, E.M. and Price, T.D. (eds.). Plenum, New York.
- Olsen, S. 2006. Early Horse Domestication on the Eurasian Steppe. Pp. 245–271 in *Documenting Domestication New Genetic and Archaeological Paradigms*. Zeder, M.A., Bradley, D., Emshwiller, E., and Smith, B.D. (eds.). University of California, Berkeley.
- Oren, E.D. 1973. The Overland Route between Egypt and Canaan in the Early Bronze Age. *Israel Exploration Journal* 23: 198–205.
- Oren, E.D. ed. 1997. *The Hyksos: New Historical and Archaeological Perspectives*. University of Pennsylvania Museum of Archaeology and Anthropology.
- Ovadia, E. 1992. The Domestication of the Ass and Pack Transport by Animals: A Case of Technological Change. Pp. 19–28 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspectives*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Palmer, E.H. 1872. *The Desert of the Exodus*. Harper and Bros, New York.
- Palmer, H.R. 1932. The Tuareg of the Sahara. *Journal of the Royal African Society* 31: 153–166.
- Parker, A.G., Goudie, A.S., Stokes, S., White, K., Hodson, J.J., Manning, M., and Kennet, D. 2006. A Record of Holocene Climate Change from Lake

- Geochemical Analyses in Southeastern Arabia. *Quaternary Research* 66: 465–476.
- Parker, S.T. 1986. *Romans and Saracens: A History of the Arabian Frontier*. American Schools of Oriental Research Dissertation Series 6, Eisenbrauns, Winona Lake, IN.
- Parker, S.T. 1987. Peasants, Pastoralists, and Pax Romana: A Different View. *Bulletin of the American Schools of Oriental Research* 265: 35–51.
- Parkinson, W.A. ed. 2002. *The Archaeology of Tribal Societies*. International Monographs in Prehistory, Ann Arbor.
- Payne, S. 1973. Kill-Off Patterns in Sheep and Goats: The Mandibles from Asvan Kale. *Anatolian Studies* 22: 281–307.
- Perevoletsky, A. 1995. Conservation, Reclamation and Grazing in the Northern Negev: Contradictory or Complementary Concepts? Pp. 1–38 in *Pastoral Development Network Papers*. Vol. 38b. Overseas Development Institute, London.
- Perkins, D. Jr. 1964. Prehistoric Fauna from Shanidar, Iraq. *Science* 144: 1565–1566.
- Perrot, J. 1968. La préhistoire palestinienne. *Supplément au Dictionnaire de la Bible*, VIII, Fasc 43: 286–446.
- Peters, E.L. 1960. The Proliferation of Segments in the Lineage of the Bedouin of Cyrenaica. *The Journal of the Royal Anthropological Institute* 90: 29–53.
- Peters, E.L. 1965. Aspects of Family among the Bedouin of Cyrenaica. Pp. 121–146 in *Comparative Family Systems*. Nimkoff, M.F. (ed.). Houghton-Mifflin, Boston.
- Peters, J., Dollfus, G., and Vigne, J.D. 1999. Les débuts de l'élevage au Proche-Orient: données nouvelles et réflexions. *Paléorient* 25(2):5-10.
- Peters, J., von den Dreisch, A., Helmer, D., and Saña-Segui, M. 1999. Early Animal Husbandry in the Northern Levant. *Paléorient* 25: 27–48.
- Petrie, W.M.F. 1917. *Tools and Weapons*. British School of Archaeology in Egypt, London.
- Politis, K.D. ed. 2007. *The World of the Nabateans*. Steiner, Stuttgart.
- Porat, N. 1989. Petrography of Pottery from Southern Israel and Sinai. Pp. 169–188 in *L'urbanisation de la Palestine à l'âge du Bronze ancien*. de Miroschedji, P. (ed.). British Archaeological Reports International 527, Oxford.
- Porat, N. 2003. Petrography of Pottery from the Survey Sites. Pp. 265–270 in *The Archaeology of Sinai, the Ophir Expedition*. Beit-Arieh, I. (ed.). Yass Publications in Archaeology 21, Tel Aviv University, Tel Aviv.
- Porat, N., Avner, U., Holzer, A., Shemtov, R., and Horwitz, L.K. 2013. Fourth-Millennium BC 'Leopard Traps' from the Negev Desert (Israel). *Antiquity* 87: 714–727.

- Porat, N., Rosen, S.A., Boaretta, E., and Avni, Y. 2006. Dating the Ramat Saharonim Late Neolithic Desert Cult Site. *Journal of Archaeological Science* 33: 1341–1355.
- Porter, A. 2004. The Urban Nomad: Countering the Old Clichés. Pp. 69–74 in *Nomades et sédentaires dans le Proche-Orient ancien*. Nicolle, C. (ed.). Amurru 3, Éditions Recherche sur les Civilisations, Paris.
- Porter, A. 2012. *Mobile Pastoralism and the Formation of Near Eastern Civilizations Weaving Together Society*. Cambridge, University, Cambridge.
- Porter, J.L. 1865. *The Giant Cities of Bashan and Syria's Holy Places*. Nelson, London.
- Portillo, M. and Albert, R.M. 2014. Early Crop Cultivation and Caprine Herding: The Evidence from Phytolith and Fecal Spherulite Studies. Pp. 121–138 in *The Sands of Time: The Desert Neolithic Settlement at Ayn Abu Nukhayla*. Henry, D.O. and Beaver, J.E. (eds.). Ex Orient, Berlin.
- Pournelle, J. 2007. From KLM to Corona: Using Satellite Imagery Toward a New Understanding of 5th/4th Millennium BCE Landscapes in Southern Mesopotamia. Pp. 26–62 in *Settlement and Society: Ecology, Urbanism, Trace and Technology in Ancient Mesopotamia*. Stone, E. (ed.). Cotsen Institute UCLA, Los Angeles. Oriental Institute, Chicago.
- Quintero, L.A., Rollefson, G.O., and Wilke, P.J. 2004. Highland Towns and Desert Settlements: Origins of Nomadic Pastoralism in the Jordanian Neolithic. Pp. 201–213 in *Central Settlements in Neolithic Jordan*. Bienert, H.D., Gebel, H.G.K., and Neef, R. (eds.). Studies in Early Near Eastern Production, Subsistence and Environment 5, Ex Orient, Berlin.
- Quintero, L.A. and Wilke, P. 1995. Evolution and Economic Significance of Naviform Core-and-Blade Technology in the Southern Levant. *Paléorient* 21: 17–33.
- Quintero, L., Wilke, P., and Rollefson, G. 2002. From Flint Mine to Fan Scraper: The Late Prehistoric Jafr Industrial Complex. *Bulletin of the American Schools of Oriental Research* 327: 17–48.
- Rabey, M.A. 1989. Are Llama-Herders in the South Central Andes True Pastoralists? Pp. 269–76 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation*. Clutton-Brock, J. (ed.). Unwin-Hyman, London.
- Rabinowitz, D. 1985. Themes in the Economy of the Bedouin of South Sinai in the Nineteenth and Twentieth Centuries. *International Journal of Middle East Studies* 17: 211–228.
- Rainey, A.F. 1987a. Review of Gottwald, N.K. The Tribes of Yahweh: A Sociology of the Religion of Liberated Israel 1250–1050 B.C.E. *Journal of the American Oriental Society* 107: 541–543.
- Rainey, A.F. 1987b. Review of Ahituv, S. Canaanite Toponyms in Ancient Egyptian Documents. *Journal of the American Oriental Society* 107: 534–

- Rainey, A.F. 1994. Remarks on Donald Redford's 'Egypt, Canaan, and Israel in Ancient Times'. *Bulletin of the American Schools of Oriental Research* 295: 81–85.
- Rainey, A.F. 2007. Whence Came the Israelites and Their Language? *Israel Exploration Journal* 57: 41–64.
- Rast, W.E. and Schaub, R.T. 2003. *Bāb Edh-Dhrā': Excavations at the Town Site (1975–81)*. Vol. 2. Eisenbrauns, Winona Lake.
- Rech, J.A., Quintero, L.A., Wilke, P.J., and Winer, E.R. 2007. The Lower Paleolithic Landscape of Ayoun Qedim, al-Jafr Basin, Jordan. *Geoarchaeology: An International Journal* 22: 261–275.
- Redding, R.W. 1984. Theoretical Determinants of a Herder's Decisions: Modeling Variation in the Sheep-Goat Ratio. Pp. 223–242 in *Animals and Archaeology 3: Early Herders and Their Flocks*. Clutton-Brock, J. and Grigson, C. (eds.). British Archaeological Reports International 202, Oxford.
- Redding, R.W. 2003. First Report on the Fauna from Chogha Bonut, Iran. Pp. 137–147 in *Excavations at the Prehistoric Mound of Chogha Bonut, Khuzestan, Iran, Seasons 1976/77, 1977/78 and 1996*. Alizadeh, A. Oriental Institute Publications 120, University of Chicago, Chicago.
- Redford, D.B. 1973. Studies in Relations between Palestine and Egypt during the First Millennium B.C.: II. The Twenty-Second Dynasty. *Journal of the American Oriental Society* 93: 3–17.
- Redford, D.B. 1990. *Egypt and Canaan in the New Kingdom*. Beer-Sheva IV, Ben-Gurion University, Beersheva.
- Redford, D.B. 1992. *Egypt, Canaan, and Israel in Ancient Times*. Princeton University, Princeton.
- Reed, C.A. 1977. Origins of Agriculture: Discussion and Some Conclusions. Pp. 879–953 in *Origins of Agriculture*. Reed, C.A. (ed.). Mouton, The Hague.
- Reese, D.S. 1991. The Trade of Indo-Pacific Shells into the Mediterranean Basin and Europe. *Oxford Journal of Archaeology* 10: 159–196.
- Reese, D.S. 1995. Shells from the Wadi Hisma sites. Pp. 385–390 in *Prehistoric Cultural Ecology and Evolution*. Henry, D.O. Plenum, New York.
- Regev, J., de Miroschedji, P., Greenberg, R., Greenhut, Z., and Boaretto, E. 2012. Chronology of the Early Bronze Age in the Southern Levant: New Analysis for a High Chronology. *Radiocarbon* 54: 535–666.
- Reimer, P.J., Bard, E., Bayliss, A., Beck, J.W., Blackwell, P.G., Bronk Ramsey, C., Buck, C.E., Cheng, H., Edwards, R.L., Friedrich, M., Grootes, P.M., Guilderson, T.P., Hafflidason, H., Hajdas, I., Hatté, C., Heaton, T.J., Hoffman, D.L., Hogg, A.G., Hughen, K.A., Kaiser, K.F., Kromer, B., Manning, S.W., Niu, M., Reimer, R.W., Richards, D.A., Scott, E.M., Southon, J.R., Staff, R.A., Turney, C.S.M., and van der Plicht, J. 2013. IntCal13 and Marine13

- Radiocarbon Age Calibration Curves 0–50,000 Years cal BP. *Radiocarbon* 55: 1869–1887.
- Renfrew, C. 1980. The Great Tradition versus the Great Divide: Archaeology as Anthropology? *American Journal of Archaeology* 84: 287–298.
- Renfrew, C. 1984. Megaliths, Territories and Populations. Pp. 165–99 in *Approaches to Social Archaeology*. Renfrew, C. (ed.). Harvard University, Cambridge, MA.
- Renfrew, C., Dixon, J.E., and Cann, J.R. 1966. Obsidian and Early Cultural Contact in the Near East. *Proceedings of the Prehistoric Society* 32: 30–72.
- Richard, S. 1980. Toward a Consensus of Opinion on the End of the Early Bronze Age in Palestine-Transjordan. *Bulletin of the American Schools of Oriental Research* 237: 5–34.
- Richard, S. 1986. Excavations at Khirbet Iskander, Jordan: A Glimpse of Settled Life during the ‘Dark Age’ in Palestinian Archaeology. *Expedition* 28: 3–12.
- Riehl, S. 2006. Nomadism, Pastoralism and Transhumance in the Archaeobotanical Record—Examples and Methodological Problems. Pp. 105–125 in *Die Sichtbarkeit von Nomaden und saisonaler Besiedlung in der Archäologie. Multidisziplinäre Annäherungen an ein methodisches Problem*. Hauser, S.R. (ed.). Orientwissenschaftliche 21, Mitteilungen des SFB, “Differenz und Integration” 9, Halle.
- Ries, M. 1972–1973. Picasso and the Myth of the Minotaur. *Art Journal* 32(2). <http://www.martinries.com/article1972-73PP.htm>.
- Rindos, D. 1984. *The Origins of Agriculture, an Evolutionary Perspective*. Academic, New York.
- Rizkana, I. and Seeher, J. 1989. *Maadi III: The Non-Lithic Small Finds and the Structural Remains of the Predynastic Settlement*. Mitteilungen des Deutschen Archäologischen Instituts Kairo 80, Cairo.
- Roberts, N. 2002. Did Prehistoric Landscape Management Retard the Post-Glacial Spread of Woodland in Southwest Asia? *Antiquity* 76: 1002–1010.
- Robertshaw, P. 1990. *Early Pastoralists of Southwestern Kenya*. British Institute in Eastern Africa Memoire 11, Nairobi.
- Robertson-Smith, W. 1927. *The Religion of the Semites*. MacMillan, New York.
- Robinson, E. and Smith, E. 1841. *Biblical Researches in Palestine, Mount Sinai, and Arabia Petraea*. John Murray, London.
- Robinson, S.A., Black, S., Sellwood, B.W., and Valdes, P.J. 2006. A Review of Palaeoclimates and Palaeoenvironments in the Levant and Eastern Mediterranean from 25,000 to 5000 Years BP: Setting the Environmental Background for the Evolution of Human Civilisation. *Quaternary Science Reviews* 25: 1517–1541.
- Rollefson, G.O. 1998. ‘Ain Ghazal (Jordan): Ritual and Ceremony III. *Paléorient* 24: 43–58.

- Rollefson, G.O. 2002. Ritual and Social Structure at Neolithic'Ain Ghazal. Pp. 165–190 in *Life in Neolithic Farming Communities*. Kuijt, I. (ed.). Kluwer, New York.
- Rollefson, G.O. and Kohler-Rollefson, I. 1989. The Collapse of Early Neolithic settlements in the Southern Levant. Pp. 73–89 in *People and Culture in Change: Proceedings of the Second Symposium on Upper Paleolithic, Mesolithic, and Neolithic Populations of Europe and the Mediterranean Basin*. HersHKovitz, I. (ed.). British Archaeological Reports International 508, Oxford.
- Rollefson, G.O., and Köhler-Rollefson, I. 1993. PPNC Adaptations in the First Half of the 6th Millennium BC. *Paléorient* 19: 33–42.
- Rollefson, G.O., Quintero, L., and Wilke, P. 1999. Bawwab al-Ghazal: Preliminary Report on the 1998 Testing Season. *Neo-Lithics* 1(99): 2–4.
- Rollefson, G., Rowan, Y., and Wasse, A. 2013. Neolithic Settlement at Wisad Pools, Black Desert. *Neo-Lithics* 13: 11–23.
- Rollefson, G., Rowan, Y., and Wasse, A. 2014. The Late Neolithic Colonization of the Eastern Badia of Jordan. *Levant* 46: 1–17.
- Ronen, A. 1970. Flint Implements from South Sinai: Preliminary Report. *Palestine Exploration Quarterly* 102: 30–41.
- Rosen, A.M. 1986a. *Quaternary Stratigraphy and Paleoenvironments of the Shephela, Israel*. Geological Survey of Israel Report, GSI/25/86, Jerusalem.
- Rosen, A.M. 1986b. Environmental Change and Settlement at Tel Lachish, Israel. *Bulletin of the American Schools of Oriental Research* 263: 55–60.
- Rosen, A.M. 1991. Early Bronze Age Tel Erani: An Environmental Perspective. *Tel Aviv* 18: 192–204.
- Rosen, A.M. 1993. Phytolith Evidence for Early Cereal Exploitation in the Levant. Pp. 160–171 in *Current Research in Phytolith Analysis: Applications in Archaeology and Paleoecology*. Pearsall, D. and Piperno, D. (eds.). MASCA Research Papers in Science and Archaeology. Vol. 10. University of Pennsylvania, Philadelphia.
- Rosen, A.M. 1995a. Preliminary Analysis of Phytoliths from Prehistoric Sites in Southern Jordan. Pp. 399–404 in *Prehistoric Cultural Ecology and Evolution: Insights from Southern Jordan*. Henry, D.O. (ed.). Plenum, New York.
- Rosen, A.M. 1995b. The Social Response to Environmental Change in Early Bronze Age Canaan. *Journal of Anthropological Archaeology* 14: 26–44.
- Rosen, A.M. 2005. Phytolith Indicators of Plant and Land Use at Çatalhöyük. Pp. 203–212 in *Çatalhöyük Project Volume IV: Inhabiting Çatalhöyük*. Hodder, I. (ed.). MacDonald Institute, Cambridge University, Cambridge.
- Rosen, A.M. 2007. *Civilizing Climate, Social Responses to Climate Change in the Ancient Near East*. Altamira Press, New York.

- Rosen, A.M., Chang, C., and Grigoriev, F. 2000. Paleoenvironments and Economy of Iron Age Saka-Wusun Agro-Pastoralists in Southeastern Kazakhstan. *Antiquity* 74: 611–623.
- Rosen, A.M., Reiczkyk, E., and Rosen, S.A. 2013. Paleoecology of Early Pastoralism in the Negev: Phytolith Tales from the Dung. Paper presented at the annual meeting of the Society for American Archaeology, Honolulu, April 3–7.
- Rosen, A.M. and Rivera-Collazo, I. 2012. Climate Change, Adaptive Cycles and the Persistence of Foraging Economies during the Late Pleistocene/Holocene Transition in the Levant. *Proceedings of the National Academy of Science* 109: 3640–3645.
- Rosen, A.M. and Rosen, S.A. 2001. Determinist or Not Determinist? Climate, Environment, and Archaeological Explanation in the Levant. Pp. 535–550 in *Studies in the Archaeology of Israel and Neighboring Lands in Memory of Douglas L. Esse*. Wolff, S. (ed.). The Oriental Institute of the University of Chicago Studies in Ancient Oriental Civilization No. 59, Chicago, and The American Schools of Oriental Research Books No. 5, Atlanta.
- Rosen, S.A. 1983a. The Microlithic Lunate: An Old-New Tool Type from the Negev, Israel. *Paleorient* 9: 81–83.
- Rosen, S.A. 1983b. The Tabular Scraper Trade: A Model for Material Culture Dispersion. *Bulletin of the American Schools for Oriental Research* 249: 79–86.
- Rosen, S.A. 1984. Kvish Harif: Preliminary Investigations at a Late Neolithic Site in the Central Negev. *Paléorient* 10: 111–121.
- Rosen, S.A. 1987. Demographic Trends in the Negev Highlands: Preliminary Results from the Emergency Survey. *Bulletin of the American Schools for Oriental Research* 266: 45–58.
- Rosen, S.A. 1988a. Notes on the Origins of Pastoral Nomadism: A Case Study from the Negev and Sinai. *Current Anthropology* 29: 498–506.
- Rosen, S.A. 1988b. Notes on the Flint Implements from Tell Yarmouth, 1980–1982. Pp. 135–142, 242–249, 279 in *Yarmouth I*. de Miroschedji, P. (ed.). Editions Recherches sur des Civilisations 76, Paris.
- Rosen, S.A. 1991. Paradigms and Politics in the Terminal Pleistocene Archaeology of the Levant. Pp. 307–321 in *Perspectives on the Past: Theoretical Biases in Mediterranean Hunter-Gatherer Research*. Clark, G.A. (ed.). University of Pennsylvania, Philadelphia.
- Rosen, S.A. 1992a. Nomads in Archaeology: A Response to Finkelstein and Perevoletsky. *Bulletin of the American Schools of Oriental Research* 287: 75–85.
- Rosen, S.A. 1992b. The Case for Seasonal Movement of Pastoral Nomads in the Late Byzantine/Early Arabic Period in the South Central Negev. Pp. 153–

- 164 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Rosen, S.A. 1993. A Roman Period Pastoral Tent Camp in the Negev, Israel. *Journal of Field Archaeology* 20: 441–451.
- Rosen, S.A. 1994. *Archaeological Survey of Israel Map of Makhtesh Ramon 204*. Israel Antiquities Authority, Jerusalem.
- Rosen, S.A. 1996. The Decline and Fall of Flint. Pp. 129–158 in *Stone Tools, Theoretical Insights into Human Prehistory*. Odell, G.H. (ed.). Plenum, New York.
- Rosen, S.A. 1997. *Lithics after the Stone Age: A Handbook of Stone Tools from the Levant*. AltaMira, Walnut Creek.
- Rosen, S.A. 2000. The Decline of Desert Agriculture: A View from the Classical Period Negev. Pp. 45–62 in *The Archaeology of Drylands*. Barker, G. and Gilbertson, D. (eds.). One World Archaeology, Routledge, London and New York.
- Rosen, S.A. 2001. The Lithic Assemblage from Biq'at 'Uvdah 917 and Its Spatial Implications. *Atiqot* 62: 109–119.
- Rosen, S.A. 2003a. Settlement and Survey Archaeology: A View from a 'Periphery'. Pp. 173–181 in *Theory and Practice in Mediterranean Archaeology: Old World and New World Perspectives*. Papadopoulos, J.K. and Leventhal, R.M. (eds.). Cotsen Advanced Seminars 1, UCLA, Los Angeles.
- Rosen, S.A. 2003b. Early Multi-Resource Nomadism: Excavations at the Camel Site in the Central Negev. *Antiquity* 77: 750–761.
- Rosen, S.A. 2006. The Tyranny of Texts: A Rebellion against the Primacy of Written Documents in Defining Archaeological Agendas. Pp. 879–893 in *I Will Speak the Riddles of Ancient Times: Archaeological and Historical Studies in Honor of Amihai Mazar on the Occasion of His Sixtieth Birthday*. Maier, A. and de Miroschedji, P. (eds.). Eisenbrauns, Winona Lake, IN.
- Rosen, S.A. 2007. The Nabateans as Pastoral Nomads: An Archaeological Perspective. Pp. 345–374 in *The World of the Nabatean*. Politis, K.D. (ed.). Steiner, Stuttgart.
- Rosen, S.A. 2008. Desert Pastoral Nomadism in the Longue Durée: A Case Study from the Negev and the Southern Levantine Deserts. Pp. 115–140 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminar Series 4, Cotsen Institute of Archaeology, Los Angeles.
- Rosen, S.A. 2009. History Does Not Repeat Itself: Cyclicity and Particularism in Nomad Sedentary Relations in the Negev in the Long Term. Pp. 57–87 in

- Nomads, Tribes and the State in the Ancient Near East: Cross-Disciplinary Perspectives*. Szuchman, J. (ed.). The Oriental Institute of the University of Chicago Seminar 5, Chicago.
- Rosen, S.A. 2011a. *An Investigation into Early Desert Pastoralism: Excavations at the Camel Site, Negev*. Cotsen Institute of Archaeology Press Monograph 69, University of California at Los Angeles, Los Angeles.
- Rosen, S.A. 2011b. The Desert and the Pastoralist: An Archaeological Perspective on Human-Landscape Interaction in the Negev over the Millennia. *Annals of Arid Zone* 50: 295–309.
- Rosen, S.A. 2011c. Desert Chronologies and Periodization Systems. Pp. 71–83 in *Culture, Chronology and the Chalcolithic: Theory and Transition*. Lovell, J. and Rowan, Y. (eds.). Council for British Research in the Levant, London.
- Rosen, S.A. 2013. Evolution in the Desert: Scale and Discontinuity in the Central Negev in the Fourth Millennium BCE. *Paléorient* 39: 139–148.
- Rosen, S.A. 2015. Cult and the Rise of Desert Pastoralism: A Case Study from the Negev. Pp. 38–47 in *Defining the Sacred: Approaches to the Archaeology of Religion in the Near East*. Laneri, N. (ed.). Oxbow, Oxford.
- Rosen, S.A. and Avni, G. 1993. The Edge of Empire: The Archaeology of Pastoral Nomads in the Southern Negev Highlands in Late Antiquity. *Biblical Archaeologist* 56: 189–199.
- Rosen, S.A. and Avni, G. 1997. *The 'Oded Sites: Investigations at Two Early Islamic Pastoral Encampments in the South Central Negev*. Beersheva XI, Ben-Gurion University, Beersheva.
- Rosen, S.A., Avni, Y., and Bar-Yosef Mayer, D. 2011. Shells, Beads, and Other Artifacts. Pp. 147–155 in *An Investigation into Early Desert Pastoralism: Excavations at the Camel Site, Negev*. Rosen, S.A. (ed.). Cotsen Institute of Archaeology Press Monograph 69, UCLA, Los Angeles.
- Rosen, S.A., Avni, Y., Bocquentin, F., and Porat, N. 2007. Investigations at Ramat Saharonim: A Desert Neolithic Sacred Precinct in the Central Negev. *Bulletin of the American Schools of Oriental Research* 346: 31–57.
- Rosen, S.A. and Goodfriend, G.A. 1993. An Early Date for Gaza Ware from the Northern Negev. *Palestine Exploration Quarterly* 125: 143–148.
- Rosen, S.A. and Rosen, Y.J. 2003. The Shrines of the Setting Sun. *Israel Exploration Journal* 53: 1–19.
- Rosen, S.A. and Saidel, B.A. 2010. The Camel and the Tent: An Exploration of Technological Change among Early Pastoralists. *Journal of Near Eastern Studies* 69: 63–77.
- Rosen, S.A., Savinetsky, A.B., Plakht, Y., Kisseleva, N.K., Khassanov, B.F., Pereladov, A.M., and Haiman, M. 2005. Dung in the Desert: Preliminary Results of the Negev Holocene Ecology Project. *Current Anthropology* 46: 317–327.

- Rosen, S.A. and Schneider, J. 2001. Early Bronze Age Milling Stone Production and Exchange in the Negev: Preliminary Conclusions. *Journal of the Israel Prehistoric Society* 31: 201–212.
- Rosen, S.A., Shugar, A., and Vardi, J. 2015. Function and Value in Sickle Segment Analysis: Odellian Perspectives. Pp. 116–30 in *Works in Stone, Contemporary Perspectives on Lithic Analysis*. Shott, M. (ed.). The University of Utah, Salt Lake City.
- Rosen, S.A., Tykot, R., and Gottesman, M. 2005. Long Distance Trinket Trade: Early Bronze Age Obsidian from the Negev. *Journal of Archaeological Science* 32: 775–784.
- Rosen, S.A. and Vardi, J. 2014. The Chipped Stone Assemblage from Be'er Resisim—A Final Report. Pp. 327–339 in *Excavations at the Early Bronze IV Sites of Jebel Qa'aqir and Be'er Resisim*. Dever, W.G. (ed.). Eisenbrauns, Winona Lake, IN.
- Rosenberg, D. 2010. Early Maceheads in the Southern Levant: A 'Chalcolithic' Hallmark in Neolithic Context. *Journal of Field Archaeology* 35: 204–216.
- Rosenberg, D. and Nadel, D. 2014. The Sounds of Pounding: Boulder Mortars and Their Significance to Natufian Burial Customs. *Current Anthropology* 55: 784–812.
- Rosenberg, M. 1990. The Mother of Invention: Evolutionary Theory, Territoriality, and the Origins of Agriculture. *American Anthropologist* 92: 399–415.
- Rosenberg, M. 1998. Cheating at Musical Chairs Territoriality and Sedentism in an Evolutionary Context. *Current Anthropology* 39: 653–681.
- Roshwalb, A. 1981. *Protohistory in the Wadi Ghazze: A Typological and Technological Study Based on the Macdonald Excavations*. Unpublished doctoral dissertation, University of London, London.
- Roshwalb, A. 1987. The Late Neolithic in the Nahal Besor. Pp. 139–151 in *Shiqmim I: Prehistoric Investigations of Early Farming Communities in the Negev*. Levy, T.E. (ed.). British Archaeological Reports International 356, Oxford.
- Rosman, A. and Rubel, P.G. 1976. Nomad-Sedentary Interethnic Relations in Iran and Afghanistan Studies. *International Journal of Middle East Studies* 7: 545–570.
- Ross, J.F. 1979. Early Bronze Age Structures at Tell el-Hesi. *Bulletin of the American Schools of Oriental Research* 236: 11–21.
- Rossignal-Strick, M. 1995. Sea-Land Correlation of Pollen Records in the Eastern Mediterranean for the Glacial-Interglacial Transition: Biostratigraphy versus Radiometric Time-Scale. *Quaternary Science Reviews* 14: 893–915.
- Rossignal-Strick, M. 1997. Paléoclimat de la Méditerranée orientale et de l'Asie

- du SudOuest de 15 000 à 6 000 BP. *Paléorient* 23: 175–186.
- Rothenberg, B. 1972. *Were These King Solomon's Mines?* Stein and Day, London.
- Rothenberg, B. and Glass, J. 1992. The Beginnings and Development of Early Metallurgy and the Settlement and Chronology of the Western Arabah from the Chalcolithic Period to the Early Bronze IV. *Levant* 24: 141–157.
- Rothenberg, B. and Weyer, H. 1980. *Sinai: Pharaohs, Miners, Pilgrims and Soldiers*. Binns, Bern.
- Rowan, Y. and Ebeling, J. eds. 2008. *New Approaches to Old Stones: Recent Studies of Groundstone Artifacts*. Equinox, London.
- Rowan, Y. and Golden, J. 2009. The Chalcolithic Period of the Southern Levant: A Synthetic Review. *Journal of World Prehistory* 22: 1–92.
- Rowan, Y., Rollefson, G.O., Wasse, A., Abu-Azizeh, W., Hill, A.C., and Kersel, M.M. 2015. The 'Land of Conjecture': New Late Prehistoric Discoveries at Maitland's Mesa and Wisad Pools, Jordan. *Journal of Field Archaeology* 40: 176–189.
- Rowley-Conwy, P. 1988. The Camel in the Nile Valley: New Radiocarbon Accelerator (AMS) Data from Qasr Ibrim. *Journal of Egyptian Archaeology* 74: 245–248.
- Rowton, M.B. 1974. Enclosed Nomadism. *Journal of the Economic and Social History of the Orient* 17: 1–30.
- Rowton, M.B. 1977. Dimorphic Structure and the Parasocial Element. *Journal of Near Eastern Studies* 36: 181–198.
- Rubin, R. 1989. The Debate Over Climatic Changes in the Negev, Fourth–Seventh Centuries CE. *Palestine Exploration Quarterly* 121: 71–78.
- Rubin, R. 1996. Urbanization, Settlement, and Agriculture in the Negev Desert –The Impact of the Roman-Byzantine Empire on the Frontier. *Zeitschrift des Deutschen Palästina-Vereins* 112: 49–60.
- Rubin, R. 1997. The Romanization of the Negev, Israel: Geographical and Cultural Changes in the Desert Frontier in Late Antiquity. *Journal of Historical Geography* 23: 267–283.
- Russell, K.W. 1988. *After Eden: The Behavioral Ecology of Early Food Production in the Near East and North Africa*. British Archaeological Reports International 391, Oxford.
- Russell, N. 2002. The Wild Side of Domestication. *Society and Animals* 10: 285–302.
- Ryan, P., Weisskopf, A., and Rosen, S.A. 2011. Sediments and Microartifacts from the Camel Site. Pp. 155–166 in *An Investigation into Early Desert Pastoralism: Excavations at the Camel Site, Negev*. Rosen, S.A. (ed.). Cotsen Institute of Archaeology Press Monograph 69, University of California at Los Angeles, Los Angeles.

- Ryder, M.L. 1969. Changes in the Fleece of Sheep following Domestication (With a Note on the Coat of Cattle). Pp. 495–521 in *The Domestication and Exploitation of Plants and Animals*. Ucko, P.J. and Dimbleby, G.W. (eds.). Aldine, Chicago.
- Ryder, M.L. 1983. *Sheep and Man*. Duckworth, London.
- Sadr, K. 1991. *The Development of Nomadism in Ancient Northeast Africa*. University of Pennsylvania, Philadelphia.
- Sahlins, M.D. 1961. The Segmentary Lineage: An Organization of Predatory Expansion. *American Anthropologist* 62: 322–345.
- Sahlins, M.D. 1968. *Tribesmen*. Prentice-Hall, Englewood Cliffs, NJ.
- Sahlins, M.D. 1972. *Stone Age Economics*. Aldine, Chicago.
- Said, E. 1978. *Orientalism*. Pantheon, New York.
- Saidel, B.A. 1998. *Arid Zone Pastoralists in the Early Bronze Age in the Southern Levant*. Unpublished doctoral dissertation, Harvard University, Cambridge.
- Saidel, B.A. 2000. Matchlocks, Flintlocks, and Saltpetre: The Chronological Implications for the Use of Matchlock Muskets among Ottomam Period Bedouin in the Southern Levant. *International Journal of Historical Archaeology* 4: 191–216.
- Saidel, B.A. 2002a. Pot luck? Variation and Function in the Ceramic Assemblages of Pre-Camel Pastoralists in the Negev Highlands, Israel. *Journal of the Israel Prehistoric Society* 32: 175–196.
- Saidel, B.A. 2002b. The Excavations at Rekhesh Nafha 396 in the Negev Highlands, Israel. *Bulletin of the American Schools of Oriental Research* 325: 37–63.
- Saidel, B.A. 2002–2004. Vessel Functions in Agricultural and Pastoral Societies of Byzantine and Early Islamic Israel. *Journal of Field Archaeology* 29: 437–445.
- Saidel, B.A. 2008a. The Bedouin Tent, an Ethno-Archaeological Portal to Antiquity or a Modern Construct? Pp. 465–486 in *The Archaeology of Mobility: Old World and New World Nomadism*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminar Series 4, Cotsen Institute of Archaeology, Los Angeles.
- Saidel, B.A. 2008b. Smoking Out Ottoman Sites in Northern Sinai, Egypt: The Use of Clay Tobacco Pipes for Identifying the Nature of Settlements in the Ottoman Period. *Palestine Exploration Quarterly* 140: 55–69.
- Saidel, B.A. 2009a. Coffee, Gender and Tobacco. Observations on the History of the Bedouin Tent. *Anthropos* 104: 179–186.
- Saidel, B.A. 2009b. Pitching Camp: Ethnoarchaeological Investigations of Inhabited Tent Camps in the Wadi Hisma, Jordan. Pp. 87–104 in *Nomads, Tribes, and States in the Ancient Near East: Cross Disciplinary*

- Perspectives*. Szuchman, J. (ed.). Oriental Institute Seminars 5, University of Chicago, Chicago.
- Saidel, B.A. 2011. The Pottery from the Camel Site. Pp. 67–80 in *An Investigation into Early Desert Pastoralism, Excavations at the Camel Site*. Rosen, S.A. (ed.). Monograph 69, Cotsen Institute of Archaeology at UCLA, Los Angeles.
- Saidel, B.A. and Erickson-Gini, T. 2014. A Note on the Excavation of an Ottoman and British Mandate Period Bedouin Campground at Nahal Be'erotayim West in the Negev Desert, Israel. *Arabian Archaeology and Epigraphy* 25: 138–145.
- Saidel, B.A. and Haiman, M. eds. 2014. *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. British Archaeological Reports International 2684, Archaeopress, Oxford.
- Sallaberger, W. 2007. From Urban Culture to Nomadism: A History of Upper Mesopotamia in the Late Third Millennium. Pp. 417–456 in *Sociétés humaines et changement climatique à la fin du troisième millénaire: une crise a-t-elle eu lieu en haute Mésopotamie?* Kuzucuoglu, C. and Marro, C. (eds.). *Varia Anatolica* 19.
- Salzman, P.C. 1971. Movement and Resource Extraction Among Pastoral Nomads: The Case of the Shah Nawazi Baluchs. *Anthropological Quarterly* 44: 185–97.
- Salzman, P.C. 1972. Multi-Resource Nomadism in Iranian Baluchistan. Pp. 60–68 in *Perspectives on Nomadism*. Irons, W. and Dyson-Hudson, N. (eds.). Brill, Leiden.
- Salzman, P.C. 1999. Is Inequality Universal? *Current Anthropology* 40: 31–61.
- Sapir-Hen, L. and Ben-Yosef, E. 2013. The Introduction of Domestic Camels to the Southern Levant: Evidence from the Aravah Valley. *Tel Aviv* 40: 277–285.
- Sauter, F., Puchinger, L., and Schoop, U.D. 2003. Studies in Organic Archaeometry: VI.1. Fat Analysis Sheds Light on Everyday Life in Prehistoric Anatolia: Traces of Lipids Identified in Chalcolithic Potsherds Excavated near Boğazkale, Central Turkey. *ARKIVOC* 15: 15–21.
- Schick, T. 1978. Flint Implements. Pp. 58–63 in *Early Arad*. Amiran, R., Paran, U., Shiloh, Y., Tsafrir, Y., Brown, R., and Ben-Tor, A. (eds.). Israel Exploration Society, Jerusalem.
- Schick, T. 1998. *The Cave of the Warrior: A Fourth Millennium Burial in the Judean Desert*. Israel Antiquities Authority, Jerusalem.
- Schmidt, K. 2010. Göbekli Tepe—The Stone Age Sanctuaries: New Results of Ongoing Excavations with a Special Focus on Sculptures and High Reliefs. *Documenta Praehistorica* 37: 239–256.
- Schrire, C. 1980. An Enquiry into the Evolutionary Status and Apparent

- Identity of San Hunter-Gatherers. *Human Ecology* 8: 9–32.
- Schuldenrein, J. and Goldberg, P. 1981. Late Quaternary Paleoenvironments and Prehistoric Site Distribution in the Lower Jordan Valley: A Preliminary Report. *Paléorient* 7: 57–72.
- Scott, T.R. 1977. The Harifian of the Central Negev. Pp. 271–322 in *Prehistory and Paleoenvironments of the Central Negev, Israel*. Vol. 2.
- Marks, A.E. (ed.). Southern Methodist University, Dallas.
- Sebbane, M., Ilan, O., Avner, U., and Ilan, D. 1993. The Dating of Early Bronze Age Settlements in the Negev and Sinai. *Tel Aviv* 20: 41–54.
- Seetzen, U.J. 1810. *A Brief Account of the Countries Adjoining the Lake of Tiberias, the Jordan, and the Dead Sea*. Palestine Association of London, Meyler and Son, London and Bath.
- Segal, D. 1999. Results of Carbon-14 Tests of Samples from Early and Middle Bronze Age Sites in Eretz-Israel and Neighboring Areas. Pp. 336–339 in *Ancient Settlement of the Central Negev*. Cohen, R. (ed.). Israel Antiquities Reports 6, Jerusalem. (Hebrew).
- Segal, I. and Roman, I. 1999. Chemical and Metallurgical Studies of Copper Ingots from Horbat 'En Ziq and Horbat Be'er Resisim. Pp. 22*–37* in *Early Settlement in the Negev Highlands*. Cohen, R. (ed.). Israel Antiquities Reports 6, Jerusalem.
- Segal, I. and Rosen, S.A. 2011. Copper Objects from the Camel Site. Pp. 123–132 in *An Investigation into Early Desert Pastoralism: Excavations at the Camel Site, Negev*. Rosen, S.A. (ed.). Monograph 69, Cotsen Institute of Archaeology at UCLA, Los Angeles.
- Servello, F. 1976. Nahal Divshon: A Pre-Pottery Neolithic B Hunting Camp. Pp. 349–370 in *Prehistory and Paleoenvironments in the Central Negev, Israel*, Vol. 1. Marks, A.E. (ed.). Southern Methodist University, Dallas.
- Shahack-Gross, R. and Finkelstein, I. 2008. Subsistence Practices in an Arid Environment: A Geoarchaeological Investigation in an Iron Age Site, the Negev Highlands, Israel. *Journal of Archaeological Science* 35: 965–982.
- Shahack-Gross, R., Marshall, F., and Weiner, S. 2003. Geo-Ethnoarchaeology of Pastoral Sites: The Identification of Livestock Enclosures in Abandoned Maasai Settlements. *Journal of Archaeological Science* 30: 439–459.
- Shahack-Gross, R., Simons, A., and Ambrose, S.H. 2008. Identification of Pastoral Sites Using Stable Nitrogen and Carbon Isotopes from Bulk Sediment Samples: A Case Study in Modern and Archaeological Pastoral Settlements in Kenya. *Journal of Archaeological Science* 35: 983–990.
- Shahiid, I. 1995. *Byzantium and the Arabs in the Sixth Century*. Vol. 1. Dumbarton Oaks, Washington, DC.
- Shalev, S. 1991. Two Different Copper Industries in the Chalcolithic Culture of Israel. Pp. 413–424 in *Découverte du Métal*. Mohen, J.P. (ed.). Picard, Paris.

- Shalev, S., Goren, Y. Levy, T.E., and Northover, P. 1992. A Chalcolithic Macehead from the Negev, Israel: Technological Aspects and Cultural Implications. *Archaeometry* 34: 63–72.
- Shamir, O. and Rosen, S.A. 2015. Early Bronze Age Textiles from the Ramon I Rock Shelter in the Central Negev. *Israel Exploration Journal* 65: 129–139.
- Sharon, M. 1975. The Political Role of the Bedouins in Palestine in the Sixteenth and Seventeenth Centuries. Pp. 11–30 in *Studies on Palestine during the Ottoman Period*. Ma'oz, M. (ed.). Magnes, Jerusalem.
- Sharon, M. 1976. Processes of Destruction and Nomadization in Eretz Israel Under Islamic Rule (633–1517 CE.. Pp. 7–32 in *Notes and Studies on the History of the Holy Land Under Islamic Rule*. Sharon, M. (ed.). Yad Ben Zvi, Jerusalem.
- Sharon, M. 1990. Arabic Rock Inscriptions from the Negev. Pp. 9–35 in *Supplement to the Map of Har Nafha (196)*. Sharon, M. and Halloun, M. Israel Antiquities Authority, Jerusalem.
- Sharp, L. 1952. Steel Axes for Stone Age Australians. *Human Organization* 11: 17–22.
- Shaw, B.D. 1982. Fear and Loathing: The Nomad Menace and Roman Africa. Pp. 29–50 in *L'Afrique Romaine—Roman Africa*. Wells, C.M. (ed.). University of Ottawa, Ottawa.
- Sherratt, A. 1981. Plough and Pastoralism: Aspects of the Secondary Products Revolution. Pp. 261–315 in *Patterns of the Past: Studies in Honour of David Clarke*. Hodder, I., Isaac, G., and Hammond, N. (eds.). Cambridge University, Cambridge.
- Sherratt, A. 1983. The Secondary Exploitation of Animals in the Old World. *World Archaeology* 15: 90–104.
- Shershofski, J. 1991. *Byzantine Urban Settlements in the Negev Desert*. Beersheva, Beer-Sheva V, Ben-Gurion University, Beershave.
- Shimelmitz, R. and Adams, M.J. 2014. Flint Knapping and the Early Bronze Age I Temple of Megiddo, Israel: Some Aspects of the Organization of Late Prehistoric Cult. *Journal of Mediterranean Archaeology* 27: 51–78.
- Shirai, N. 2009. *The Archaeology of the First Farmer-Herders in Egypt: New Insights into the Faym Epipaleolithic and Neolithic*. Doctoral dissertation, University of Leiden, Leiden.
- Shishlina, N.I., Zazavoskaya, E.P., van der Plicht, J., Hedges, R.E.M., Sevastyanov, V.S., and Chichagova, O.A. 2009. Paleoecology, Subsistence, and ¹⁴C Chronology of the Eurasian Caspian Steppe Bronze Age. *Radiocarbon* 51: 481–499.
- Shugar, A.N. 2001. *Archaeometallurgical Investigation of the Chalcolithic Site of Abu Matar, Israel: A Reassessment of Technology and Its Implications for the Ghassulian Culture*. Unpublished doctoral dissertation, Institute of

- Archaeology, University College London, London.
- Shugar, A.N., and Gohm, C.J. 2011. Developmental Trends in Chalcolithic Copper Metallurgy: A Radiometric Perspective. Pp. 133–148 in *Culture, Chronology and the Chalcolithic: Theory and Transition*. Lovell, J. and Rowan, Y. (eds.). Council for British Research in the Levant, London.
- Sidebotham, S.E., Barnard, H., and Pyke, G. 2002. Five Enigmatic Late Roman Settlements in the Eastern Desert. *The Journal of Egyptian Archaeology* 88: 187–225.
- Siegal, U. 2009. Hydrological Structures in the Wādi al-Yutum in the Vicinity of Tall Ḥujayrāt al-Ghuzlān. Pp. 273–294 in *Prehistoric 'Aqaba I*. Khalil, L. and Schmidt, K. (eds.). Orient-Archäologie, Band 23, Mari Leidorf, Rahden.
- Siegel, J. 1976. Animal Palaeopathology: Possibilities and Problems. *Journal of Archaeological Science* 3: 349–384.
- Sigrist, C. 2004. Segmentary Societies: The Evolution and Actual Relevance of an Interdisciplinary Conception. Pp. 3–31 in *Segmentation und Komplementarität. Organisatorische, ökonomische und kulturelle Aspekte der Interaktion von Nomaden und Sesshaften*. Treck, B. (ed.). Orientwissenschaftliche Hefte 14; Mitteilungen des SFB 'Differenz und Integration' 6:3-31, Halle.
- Silberman, N.A. 1982. *Digging for God and Country*. Knopf, New York.
- Silberman, N.A. and Finkelstein, I. 2002. *The Bible Unearthed: Archaeology's New Vision of Ancient Israel and the Origin of Its Sacred Texts*. Simon and Schuster, New York.
- Simmons, A.H. 1981. A Paleosubsistence Model for Early Neolithic Occupation of the Western Negev Desert. *Bulletin of the American Schools of Oriental Research* 242: 31–49.
- Simmons, A.H. 2007. *The Neolithic Revolution in the Near East*. University of Arizona, Tucson.
- Simmons, A.H. and Ilany, G. 1975–1977. What Mean These Bones? Behavioral Implications of Gazelles' Remains from Archaeological Sites. *Paléorient* 3: 269–274.
- Simms, S.R. 1988. The Archaeological Structure of a Bedouin Camp. *Journal of Archaeo-logical Science* 15: 197–211.
- Simms, S.R. and Russell, K.W. 1997. Tur Imdai Rockshelter: Archaeology of Recent Pastoralists in Jordan. *Journal of Field Archaeology* 24: 459–472.
- Smail, D.L. 2007. *On Deep History and the Brain*. University of California, Berkeley.
- Smith, A.B. 1980. Domesticated Cattle in the Sahara and Their Introduction into West Africa. Pp. 489–501 in *The Sahara and the Nile*. Williams, M.A.J. and Faure, H. (eds.). Balkema, Rotterdam.
- Smith, A.B. 1986. Cattle Domestication in North Africa. *African Archaeological*

- Smith, A.B. 1989. The Near Eastern Connection: Early to Mid Holocene Relations between North Africa and the Levant. Pp. 69–78 in *Late Prehistory of the Nile Basin and the Sahara*. Krzyzaniak, L. and Kabusiewicz, M. (eds.). Poznan Archaeological Museum, Poznan.
- Smith, A.B. 2000. Ideas on the Later Cultural History of the Central Sahara. *Sahara* 12: 101–106.
- Smith, A.B. 2005. *African Herders*. Altamira Press, Walnut Creek.
- Smith, A.B. 2008. Is Absence of Evidence, Evidence of Absence? Problems in the Archaeology of Early Herding Societies of Southern Africa. Pp. 267–279 in *The Archaeology of Mobility*. Barnard, H. and Wendrich, W. (eds.). Cotsen Advanced Seminars 4, Cotsen Institute of Archaeology, UCLA, Los Angeles.
- Smith, C.S., Byers, D.A., and Craven, C.D. 2008. Bison Exploitation in the Wyoming Basin at the Middle/Late Holocene Transition: A View from the Graham Ranch Site. *Plains Anthropologist* 53: 313–332.
- Smith, E.A. 1983. Anthropological Applications of Optimal Foraging Theory: A Critical Review. *Current Anthropology* 24: 625–651.
- Smith, P. and Horwitz, L.K. 1984. Radiographic Evidence for Changing Patterns of Animal Exploitation in the Southern Levant. *Journal of Archaeological Science* 11: 467–475.
- Solway, J.S. and Lee, R.B. 1990. Foragers, Genuine or Spurious: Situating the Kalahari San in History. *Current Anthropology* 31: 109–146.
- Spalinger, A.J. 2008. A Garland of Determinatives. *The Journal of Egyptian Archaeology* 94: 139–164.
- Sprenger, H. 1987. The Métis Nation: Buffalo Hunting versus Agriculture in the Red River Settlement, 1810–1870. Pp. 120–135 in *Native People, Native Lands: Canadian Indians, Inuit and Metis*. Cox, B.A. (ed.). Carleton Library Series 142, Carleton University Press, Ottawa.
- Stager, L.E. 1992. The Periodization of Palestine from Neolithic through Early Bronze Times. Pp. 22–41 in *Chronologies in Old World Archaeology*. Ehrich, R.W. (ed.). University of Chicago, Chicago.
- Stager, L.E. 2006. Biblical Philistines: A Hellenistic Literary Creation. Pp. 375–384 in *I Will Speak the Riddles of Ancient Times: Archaeological and Historical Studies in Honor of Amihai Mazar on the Occasion of His Sixtieth Birthday*. Maier, A. and de Miroschedji, P. (eds.). Eisenbrauns, Winona Lake, IN.
- Steensberg, A. 1943. *Ancient Harvesting Implements*. Nationalmuseets skrifter, Copenhagen.
- Steimer-Herbet, T., Davtian, G., and Braemer, F. 2006. Pastoralists' Tombs and Settlement Patterns in Wādī Wash'ah during the Bronze Age (Ḥaḍramawt,

- Yemen). *Proceedings of the Seminar for Arabian Studies* 36: 257–265.
- Stein, A. 1940. Surveys on the Roman Frontier in Iraq and Trans-Jordan. *Geographical Journal* 95: 428–438.
- Stekelis, M. 1956. The Negev in Prehistoric times. *Bulletin of the Israel Exploration Society* 20: 101–107. (Hebrew).
- Stekelis, M. 1972. *The Yarmukian Culture of the Neolithic Period*. Magnes, Jerusalem.
- Stern, E., Gradus, Y., Meir, A., Krakover, S., and Tsoar, H. 1986. *Atlas of the Negev*. Department of Geography, Ben-Gurion University, Beersheva.
- Stewart, F.H. 1988. *Texts in Sinai Bedouin Law*. Harrassowitz, Wiesbaden.
- Stewart, F.H. 1991. Notes on the Arrival of the Bedouin Tribes in Sinai. *Journal of the Economic and Social History of the Orient* 34: 97–110.
- Stewart, H. 1977. *Indian Fishing: Early Methods on the Northwest Coast*. Douglas and McIntyre, Vancouver.
- Stiller, M., Ehrlich, A., Pollinger, U., Baruch, U., and Kaufman, A. 1984. The Late Holocene Sediments of Late Kinneret (Israel)—Multidisciplinary Study of a Five Meter Core. Pp. 83–88 in *Geological Survey of Israel, Current Research, 1983–84*. Ehrlich, A. (ed.). Geological Survey of Israel, Jerusalem.
- Stock, F. and Gifford-Gonzalez, D. 2013. Genetics and African Cattle Domestication. *African Archaeological Review* 30: 51–72.
- Stordeur, D., Der Aprahamian, G., Brenet, M., and Roux, J.C. 2000. Les bâtiments communautaires de Jerf el Ahmar et Mureybet horizon PPNA (Syrie). *Paléorient* 26: 29–44.
- Strabo. *The Geography*. <http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Strabo/home.html>.
- Stuart, A.J. 1991. Mammalian Extinctions in the Late Pleistocene of Northern Eurasia and North America. *Biological Reviews* 66: 453–562.
- Sukumar, R. 2003. *The Living Elephants*. Oxford University Press, Oxford.
- Sumner, W. 1986. Proto-Elamite Civilization in Fars. Pp. 199–211 in *Ġamdat Našr: Period or Regional Style?* Finkbeiner, U. and Rollig, W. (eds.). Springer, Wiesbaden.
- Sutter, J.W. 1987. Cattle and Inequality: Herd Size Differences and Pastoral Production among the Fulani of Northeastern Senegal. *Africa* 57: 196–218.
- Swagerty, W.R. 1980. Marriage and Settlement Patterns of Rocky Mountain Trappers and Traders. *The Western Historical Quarterly* 11: 159–180.
- Sweeney, D. 1995. Review of Redford, D.B. Egypt and Canaan in the New Kingdom. *Israel Exploration Journal* 45: 206–208.
- Sweet, L. 1965. Camel Raiding of the North Arabian Bedouin: A Mechanism of Ecological Adaptation. *American Anthropologist* 67: 1132–1150.
- Szuchman, J. ed. 2009. *Nomads, Tribes and the State in the Ancient Near East: Cross-Disciplinary Perspectives*. The Oriental Institute of the University of

Chicago Seminar 5, Chicago.

- Tadmor, M., Kedem, D., Begemann, F., Hauptmann, A., Pernicka, E., and Schmitt-Strecker, S. 1995. The Nahal Mishmar Hoard from the Judean Desert: Technology, Composition and Provenance. *Atiqot* 27: 95–148.
- Tapper, R. 1979. The Organization of Nomadic Communities in Pastoral Societies of the Middle East. Pp. 43–66 in *Pastoral Production and Society*. Equipe Ecologie et Anthropologie des Sociétés Pastorales. Cambridge University, Cambridge.
- Tapper, R. 1990. Anthropologists, Historians, and Tribespeople on Tribe and State Formation in the Middle East. Pp. 48–73 in *Tribes and State Formation in the Middle East*. Khoury, P.S. and Kostner, J. (eds.). University of California, Berkeley.
- Tarawneh, M.B. and Abudanah, F.Q. 2013. Subsistence of Early Pastoral Nomadism in the Southern Levant: New Data from Eastern Bayir. *Syria* 90: 231–252.
- Tchernov, E. 1991. Of Mice and Men. Biological Markers for Long-Term Sedentism; a Reply. *Paléorient* 17: 153–160.
- Tchernov, E. and Bar-Yosef, O. 1982. Animal Exploitation in the Pre-Pottery Neolithic B at Wadi Tbeik, Southern Sinai. *Paléorient* 8(2): 17–37.
- Tilley, C. 1994. *A Phenomenology of Landscape*. Berg, Oxford.
- Trigger, B. 1989. *A History of Archaeological Thought*. Cambridge University, Cambridge.
- Trimble, C.E., Sommer, B.W., Quinlan, M.K. 2008. *The American Indian Oral History Manual, Making Many Voices Heard*. Left Coast Press, Walnut Creek.
- Trut, L.N. 1999. Early Canid Domestication: The Farm-Fox Experiment. *American Scientist* 87: 160–69.
- Turville-Petre, F.A.J. 1927. *Researches in Prehistoric Galilee, 1925–1926*. Bulletin of the British School of Archaeology in Jerusalem 14, London.
- Twain, M. 1869. *The Innocents Abroad, or the New Pilgrim's Progress*. American Publishing, Hartford.
- Twiss, K.C. and Russell, N. 2009. Taking the Bull by the Horns: Ideology, Masculinity, and Cattle Horns at Çatal Höyük (Turkey). *Paléorient* 35: 19–32.
- Uerpmann, H.P. and Uerpmann, M. 2002. The Appearance of the Domestic Camel in South-East Arabia. *Journal of Oman Studies* 12: 235–260.
- Ullah, I.T. 2011. A GIS Method for Assessing the Zone of Human-Environmental Impact around Archaeological Sites: A Test Case from the Late Neolithic of Wadi Ziqlâb, Jordan. *Journal of Archaeological Science* 38: 623–632.
- Ullah, I.T. 2013. *The Consequences of Human Land-use Strategies During the*

- PPNB-LN *Transition: A Simulation Modeling Approach*. Unpublished doctoral dissertation, Arizona State University, Tempe.
- Unger-Hamilton, R. 1989. The Epi-Palaeolithic Southern Levant and the Origins of Cultivation. *Current Anthropology* 30: 88–103.
- Ur, J. 2003. CORONA Satellite Photography and Ancient Road Networks: A Northern Mesopotamian Case Study. *Antiquity* 77: 102–115.
- Urman, D. 2004. *Nessana Excavations and Studies I*. Beer-Sheva XVII, Ben-Gurion University, Beersheva.
- Ussishkin, D. 1982. *The Conquest of Lachish by Sennacherib*. Tel Aviv University, Tel Aviv.
- van Berg, P.L., Vander Linden, M., Picalause, V., Lemaitre, S., and Cauwe, N. 2004. Desert-Kites of the Hemma Plateau (Hassake, Syria). *Paléorient* 30: 89–99.
- van Zeist, W. and Bottema, S. 1982. Vegetational History of the Eastern Mediterranean and the Near East during the Last 20000 Years. Pp. 277–321 in *Paleoclimates, Paleoenvironments, and Human Communities in the Eastern Mediterranean Region in Later Prehistory*. Bintliff, J.L., and van Zeist, W. (eds.). British Archaeological Reports International 133, Oxford.
- van Zeist, W. and Woldring, H. 1978. A Postglacial Pollen Diagram from Lake Van in East Anatolia. *Review of Paleobotany and Palynology* 26: 249–276.
- Vardi, J. 2005. *The Analysis of the Lithic Assemblage from Ein Ziq, An Early Bronze IV (2300–2000 BCE) Site in the Negev Highlands*. Unpublished MA thesis, Ben-Gurion University, Beersheva. (Hebrew).
- Vardi, J. 2014. The Lithic Assemblages. Pp. 59–168 in *Excavations in the Western Negev Highlands Results of the Negev Emergency Survey 1978–89*. Saidel, B.A. and Haiman, M. (eds.). British Archaeological Reports International 2684, Archaeopress, Oxford.
- Vardi, J., Yegorov, D., and Eisenberg-Degen, D. 2014. Har Harif. *Excavations and Surveys in Israel*. 126 http://www.hadashot-si.org.il/Report_Detail_Eng.aspx?id=13676.
- Verhoeven, M. 2002. Ritual and Ideology in the Pre-Pottery Neolithic B of the Levant and Southeast Anatolia. *Cambridge Archaeological Journal* 12: 233–258.
- Vermeersch, P.M. 2012. Contributions to the Prehistory of the Eastern Desert, Egypt. Pp. 24–41 in *History of the Peoples of the Eastern Desert*. Barnard, H. and Duistermaat, K. (eds.). Cotsen Institute of Archaeology Monograph 73, UCLA, Los Angeles.
- Vigne, J.D., Carrère, I., Saliège, J.F., Person, A., Bocherens, H., Guilaine, J., and Briois, F. 2000. Predomestic Cattle, Sheep, Goat and Pig during the Late 9th and the 8th Millennium Cal. BC on Cyprus: Preliminary Results of Shillourokambos (Perkklisha, Limassol). Pp. 52–75 in *Archaeozoology of the*

- Near East IV. Mashkour, M., Choyke, A.M., Buitenhuis, H., and Poplin, F. (eds.). Archaeological Research and Consultancy, Groningen.
- Vikør, K.S. 1982. The Desert-Side Salt Trade of Kavar. *African Economic History* 11: 115–144.
- Vita Finzi, C. 1969. *The Mediterranean Valleys*. Cambridge University Press: Cambridge.
- Wagstaff, J.M. 1981. Buried Assumptions: Some Problems in the Interpretation of the ‘Younger Fill’ Raised by Recent Data From Greece. *Journal of Archaeological Science* 8: 247–264.
- Wainwright, G.A. 1964. Shekelesh or Shasu? *The Journal of Egyptian Archaeology* 50: 40–46.
- Wallerstein, I. 1974. *The Modern World System*. Vol. 1. Academic, New York.
- Wallerström, T. 2000. The Saami between East and West in the Middle Ages: An Archaeological Contribution to the History of Reindeer Breeding. *Acta Borealia* 17: 3–39.
- Wapnish, P. 1981. Camel Caravans and Camel Pastoralists at Tell Jemmeh. *Journal of the Ancient Near Eastern Society of Columbia University* 13: 101–121.
- Ward, W.A. 1972. The Shasu ‘Bedouin’: Notes on a Recent Publication. *Journal of the Economic and Social History of the Orient* 15: 35–60.
- Ward, W.A. 1994. Review of Redford, D.B. Egypt, Canaan, and Israel in Ancient Times. *Journal of the American Oriental Society* 114: 510–512.
- Warmuth, V., Eriksson, A., Bower, M.A., Barker, G., Barrett, E., Hanks, B.K., Lid, S., Lomitashvili, D., Ochir-Goryaevaf, M., Sizonovg, G.V., Soyonovh, V., and Manica, A. 2012. Reconstructing the Origin and Spread of Horse Domestication in the Eurasian Steppe. *Proceedings of the National Academy of Sciences* 109: 8202–8206.
- Watson, P.J. 1979. *Archaeological Ethnography in Western Iran*. Viking Fund Publications in Anthropology 57, University of Arizona Press, Tucson.
- Wayne, R.K., and Ostrander, E.A. 1999. Origin, Genetic Diversity, and Genome Structure of the Domestic Dog. *BioEssays* 21: 247–257.
- Weinstein, J.M. 1981. The Egyptian Empire in Palestine: A Reassessment. *Bulletin of the American Schools of Oriental Research* 241: 1–28.
- Weippert, M. 1974. Semitische Nomaden des zweiten Jahrtausends: Über die Šššw der ägyptischen Quellen. *Biblica* 55: 265–280.
- Weisiger, M. 2004. The Origins of Navajo Pastoralism. *Journal of the Southwest* 46: 253–282.
- Weiss, E., Kislev, M.E., Simchoni, O., and Nadel, D. 2004. Small-Grained Wild Grasses as Staple Food at the 23,000-Year-Old Site of Ohalo II, Israel. *Economic Botany* 58(Supplement): 125–134.
- Weiss, H., Courty, M.A., Wetterstrom, W., Guichard, F., Senior, L., Meadow, R.,

- and Curnow, A. 1993. The Genesis and Collapse of Third Millennium North Mesopotamian Civilization. *Science* 261: 995–1004.
- Wellhausen, J. 1885. *Prolegomena to the History of Israel*. Adam and Charles Black, Edinburgh.
- Weninger, B., Clare, L., Rohling, E.J., Bar-Yosef, O., Böhner, U., Budja, M., Bundschuh, M., Feudean, A., Gebel, H.G., Jöris, O., Linstädter, J., Mayewski, P., Mühlenbruch, T., Reingruber, A., Rollefson, G., Schyle, D., Thissen, L., Todorova, H., and Zielhofer, C. 2009. The Impact of Rapid Climate Change on Prehistoric Societies during the Holocene in the Eastern Mediterranean. *Documenta Praehistorica* 36: 7–59.
- Wenning, R. 2007. The Nabataeans in History (before AD 106). Pp. 25–44 in *The World of the Nabataeans*. Politis, K.D. (ed.). Steiner, Stuttgart.
- Wente, E.F. 1963. Shekelesh or Shasu? *Journal of Near Eastern Studies* 22: 167–172.
- Wheeler, J.C. 1995. Evolution and Present Situation of the South American Camelidae. *Biological Journal of the Linnean Society* 54: 271–293.
- Wheeler Pires-Ferreira, J. 1975. Tepe Tula'i: Faunal Remains from an Early Campsite in Khuzistan, Iran. *Paléorient* 3: 275–280.
- Wick, L., Lemcke, G., and Sturm, M. 2003. Evidence of Late Glacial and Holocene Climatic Change and Human Impact in Eastern Anatolia: High Resolution Pollen, Charcoal, Isotopic and Geochemical Records from the Laminated Sediments of Lake Van, Turkey. *The Holocene* 13: 665–675.
- Wiessner, P. 1983. Style and Social Information in Kalahari Projectile Points. *American Antiquity* 48: 253–276.
- Wiessner, P. 1984. Reconsidering the Behavioral Basis for Style: A Case Study among the Kalahari San. *Journal of Anthropological Archaeology* 3: 190–234.
- Wilmsen, E. 1989. *A Land Filled with Flies*. University of Chicago, Chicago.
- Winter-Livneh, R., Svoray, T., and Gilead, I. 2010. Settlement Patterns, Social Complexity and Agricultural Strategies during the Chalcolithic Period in the Northern Negev, Israel. *Journal of Archaeological Science* 37: 284–294.
- Winter-Livneh, R., Svoray, T., and Gilead, I. 2012. Secondary Burial Cemeteries, Visibility and Land Tenure: A View from the Southern Levant Chalcolithic Period. *Journal of Anthropological Archaeology* 31: 423–438.
- Woolley, C.L. and Lawrence, T.E. 1915. *The Wilderness of Zin*. Palestine Exploration Fund, London.
- Worschech, U. 1997. Egypt and Moab. *The Biblical Archaeologist* 60: 229–236.
- Wreschner, E.E. 1980. Red Ochre and Human Evolution: A Case for Discussion. *Current Anthropology* 21(5): 631–644.
- Wright, H.E. Jr. and Thorpe, J.L. 2003. Climatic Change and the Origin of Agriculture in the Near East. Pp. 49–92 in *Global Change in the Holocene*.

- Mackay, A., Battarbee, R., Birks, J., and Oldfield, F. (ed.). Arnold Press, London.
- Wright, K.E. 1993. Early Holocene Ground Stone Assemblages in the Levant. *Levant* 25: 93–101.
- Wright, K.E. 1994. Ground-Stone Tools and Hunter-Gatherer Subsistence in Southwest Asia: Implications for the Transition to Farming. *American Antiquity* 59: 238–263.
- Wright, K.E. and Garrard, A.N. 2003. Social Identities and the Expansion of Stone Bead Making in Neolithic Western Asia: New Evidence from Jordan. *Antiquity* 77: 267–284.
- Wylie, A. 1985. The Reaction against Analogy. *Advances in Archaeological Method and Theory* 8: 63–111.
- Yagodin, V.N., Betts, A.V.G., and Blau, S. 2007. *Ancient Nomads of the Aralo-Caspian Region: The Duana Archaeological Complex*. Ancient Near Eastern Studies Supplement Series 25, Peeters, Louvain.
- Yakir, D., Issar, A., Gat, J., Adar, E., Trimborn, P., and Lipp, J. 1994. ^{13}C and ^{18}O of Wood from the Roman Siege Rampart in Masada, Israel (AD 70–73): Evidence for a Less Arid Climate for the Region. *Geochimica et Cosmochimica Acta* 58(16): 3535–3539.
- Yekutieli, Y. 2002. Settlement and Subsistence Patterns in North Sinai during the Fifth to Third Millennia BCE. Pp. 422–433 in *Egypt and the Levant*. van den Brink, E.C.M. and Levy, T.E. (eds.). Leicester University, London.
- Yekutieli, Y. 2006. Aspects of an Early Bronze Age II–III Polity in the Dead Sea Region. Pp. 103–124 in *Crossing the Rift: Resources, Routes, Settlement Patterns and Interaction in the Wadi Arabah*. Bienkowski, P. and Galor, K. (eds.). Levant Supplementary Series 3, Council for British Research in the Levant, London.
- Yekutieli, Y. 2007. Bet al-Malahi. Pp. 127–138 in *On the Fringe of Society: Archaeological and Ethnoarchaeological Perspectives on Pastoral and Agricultural Societies*. Saidel, B. and van der Steen, E. (eds.). Archaeopress, Oxford.
- Yellin, J., Levy, T.E., and Rowan, Y.M. 1996. New Evidence on Prehistoric Trade Routes: The Obsidian Evidence from Gilat, Israel. *Journal of Field Archaeology* 23: 361–368.
- Yerkes, R.W., Barkai, R., and Gopher, A. 2003. Microwear Analyses of Early Neolithic (PPNA) Axes and Bifacial Tools from Netiv Hagdud in the Jordan Valley, Israel. *Journal of Archaeological Science* 30: 1051–1066.
- Yoffee, N. and Cowgill, G.L. eds. 1991. *The Collapse of Ancient States and Civilizations*. University of Arizona, Tucson.
- Yogev, O. 1983. A Fifth Millennium Sanctuary in the 'Uvda Valley. *Qadmoniot* 16(4): 118–22. (Hebrew).

- Younker, R.W. 1999. The Emergence of the Ammonites. Pp. 198–218 in *Ancient Ammon*. MacDonald, B. and Younker, R.W. eds. Brill, Leiden.
- Zarins, J. 1978. The Camel in Ancient Arabia: A Further Note. *Antiquity* 52: 44–46.
- Zarins, J. 1992. Pastoral Nomadism in Arabia: Ethnoarchaeology and the Archaeological Record—A Case Study. Pp. 219–240 in *Pastoralism in the Levant: Archaeological Materials in Anthropological Perspective*. Bar-Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison.
- Zeder, M.A. 1999. Animal Domestication in the Zagros: A Review of Past and Current Research. *Paléorient* 25: 11–25.
- Zeder, M.A. 2006. A Critical Assessment of Markers of Initial Domestication in Goats (*Capra hircus*). Pp. 181–208 in *Documenting Domestication New Genetic and Archaeological Paradigms*. Zeder, M.A., Bradley, D., Emshwiller, E., and Smith, B.D. (eds.). University of California, Berkeley.
- Zeder, M.A. 2008. Animal Domestication in the Zagros: An Update and Directions for Future Research. *Archaeozoology of the Near East* 8: 243–77.
- Zeder, M.A. 2011. The Origins of Agriculture in the Near East. *Current Anthropology* 52(S4, The Origins of Agriculture: New Data, New Ideas): 221–235.
- Zeder, M.A. 2012. The Domestication of Animals. *Journal of Anthropological Research* 68: 161–190.
- Zeder, M.A., Bar-Oz, G., Rufolo, S.J., and Hole, F. 2013. New Perspectives on the Use of Kites in Mass-Kills of Levantine Gazelle: A View from Northeastern Syria. *Quaternary International* 297: 110–125.
- Zeder, M.A., Bradley, D., Emshwiller, E., and Smith, B.D. eds. 2006. *Documenting Domestication New Genetic and Archaeological Paradigms*. University of California Press, Berkeley.
- Zeder, M.A. and Hesse, B. 2000. The Initial Domestication of Goats (*Capra Hircus*) in the Zagros Mountains 10,000 Years Ago. *Science* 287(5461): 2254.
- Zeuner, F.E. 1946. *Dating the Past*. Methuen, London.
- Zeuner, F.E. 1958. Dog and Cat in the Neolithic of Jericho. *Palestine Exploration Quarterly* 90: 52–55.
- Zohar, M. 1992. Megalithic Cemeteries in the Levant. Pp. 43–64 in *Pastoralism in the Levant-Archaeological Materials in Anthropological Perspectives*. Bar Yosef, O. and Khazanov, A.M. (eds.). Monographs in World Archaeology 10, Prehistory Press, Madison, WI.
- Zohary, D. and Spiegel-Roy, P. 1975. Beginning of Fruit Growing in the Old World. *Science* 187: 319–327.
- Zohary, D., Tchernov, E., and Horwitz, L.K. 1998. The Role of Unconscious Selection in the Domestication of Sheep and Goats. *Journal of Zoology* 245:

- Zohary, M. 1953. Ecological Studies in the Vegetation of Near Eastern Deserts
IIIL Vegetation Map of the Central and Southern Negev. *Palestine Journal
of Botany* 6: 27–36.
- Zohary, M. 1956. Vegetation. *Atlas of Israel*. Sect. IV, Bialik Institute and the
Ministry of Labor, Jerusalem.

Index

8.2 kya event 161–2

4.2 k event 52, 86, 205, 216

Abar Idied (Be'erot Oded) 232, 233

Abde 242, 244

Abdel el-Malik 234

Abraham 209

Abu Afash 245

Abu Ghosh 101

Abu Maadi 92, 96, 101

Abu Salem 101

ad hoc 14, 78, 244; industry 181–2; lithics 148–9, 153; repairs 136; tools 149

aerial reconnaissance 56

age profiles 70*n*3

agriculture 17, 25, 30, 34, 51, 181–2; archaeological evidence 67, 85, 90, 95, 97–9, 109, 120, 132, 169–70; Bedouin 214, 240; classical period nomadism 218, 220; horticulture 30, 228; irrigation 30, 51, 81, 88–9, 170, 199, 206, 218, 227–8, 234, 244; origins of 41–3, 48; pastoral nomadism 51, 60; rainfall 32, 43, 73–7, 79–88; subsistence 172–5, 241; systematic 95, 125, 174–5, 232, 242–3

Ain Abu Nukhayla 92, 94, 99, 101, 109*n*5

Ain Ghazal 51, 101, 108–9*n*4, 110, 127, 133, 143

al-Ghirqa 130*n*5

alluvial systems 82–3, 85–6, 239

al-Murrah 32, 35, 59, 66, 213

alpacas 27, 44

al-Thulaythuwat 136, 146, 176

Amalekites 211

Amman 73, 77, 88

Amorites 1, 62, 205

Amuq points 103, 104, 118, 121, 150

Anabasida hausknechti 74

Anabasidetum articulatae 74

analogy: ethnographic 5–6, 26, 54, 63–5, 178

ancient genes 17–18

Andes 24*n*2, 29, 44

animal bone: analysis 58–9, 68; archaeology 7, 56; assemblages 95, 172, 246; pathologies 15

animal domestication 8, 18; evidence in faunal record 18–19; goats 110–12; identifying 14–22; sheep 13, 94–5, 99; *see also* herder-gatherers

animals: exploitation of 27–9; husbandry 3, 12; pens 136, 139; use in mobile pastoralism 49

anthropology 2, 7, 15, 70*n*2

apatite 155
 Aqaba 77, 133; Gulf of 71–6; sites 158, 166n11, 168, 170, 172, 174, 182, 186, 193
 arab al-Hġerāt 213
 Arabia 35, 38, 73, 77, 79; Lawrence of 1
 Arabian Peninsula 19, 32, 72, 79, 95, 136, 147, 220
 Arabic rock inscriptions 61, 232, 234
 Arabs 45, 62
 Arad 157, 167–8, 170, 172–3, 175, 177, 179, 182–8, 193, 201–2, 203n10, 203n12, 203n7, 207, 210–11, 217
 Aradian buildings 170
 Arad Letters 210
 Arava 71, 77, 221, 234, 245
 Arava Valley 76–7
 archaeology 54; aerial and satellite reconnaissance 56–7; Bedouin, texts and 213–15; Bronze Age 54–5; classical 54, 55; ethnographic analogy 5–6, 26, 54, 63–5, 178; excavations 67–8; history and prehistory 55; ideologies of historical 58; implications of methods on nomads 65–9; integration with texts 69–70; Iron Age 54–5; Near Eastern 57; pastoral nomadic people 53–4; pastoral nomadism after revolutions 246–7; pastoral nomads 58; prehistoric, in Near East 55–6; prehistoric hunter-gatherers 58; remains of hunter-gatherers 65–9; role in nomads and nomadism 3–6, 52; Stone Age 58–9
 Archaic period 13
 Armenia 142, 157
 arrowheads: decline in 15, 100, 111–12, 124, 140, 174; diffusion of 95, 98, 123; paradigms 129; production of 102–3, 106–7, 130n5–6, 138, 164; role in hunting 99; seriation 96; transverse points 104, 112, 121, 124, 130n5, 140, 142, 150, 154–5, 161, 174, 177, 181; types of 104, 118, 121, 142, 149–50, 154–5, 161n4, 180–2, 200, 206
 arsenical copper 186
Artemisia herba alba 74
 Assyria 40, 61, 214
 Atzmaut Rock Shelter 207, 235n2, 238
 aurochs 16, 18
 Avdat 207, 220–3, 226, 227, 229, 234, 242
 axes/adzes 103, 148–9, 153, 157, 164, 181, 186–7; votive 181
 Ayaydah 39
 Azraq Basin 73, 77, 81, 92, 95, 101, 121, 127, 130n5, 155

 Bab edh Dhra 133, 150, 168, 177, 179, 182, 184, 202
 Badia 66, 73, 77, 79, 120–1
 Bakhtiari 24n3, 28, 32, 66, 213
 Balkans 21
 bands 162, 174; hunting 53, 106–7, 122–4
 Bani al Udayyid 233
 barley 73, 81, 88, 95, 101, 174
 barns 22
 basalt 77, 153, 157, 164, 166n16, 181, 183, 186, 203n10, 232
 baselines: origins 42–5
 Basseri 32, 34, 38
 beads 123, 129, 148, 184–5, 246; copper 164; gold 184, 192, 194, 198; manufacture 143, 155, 181–2, 185; marble 122; shell 105, 107, 122, 146, 155, 185, 192, 195–6; stone 122, 155

Bedouin 9, 14, 24, 162, 226, 228, 247; agriculture map 240; archaeology of recent 241–6; camps 56, 59, 67, 137, 139, 236ⁿ¹⁷; earliest evidence 114; economy 30–1; ethnography 61–3, 174–5, 178–9, 198; migration 34–5; population of Negev 244; rock art 158; society 37–40; storage bins 242; subsistence 93; tent camp 240; term 211; text, archaeology and 213–15; tombs 146; tribes 237–41

Be'er Ada 133, 138

Be'er Osnat 116, 120

Be'erotayim 237

Be'erot Oded (Abar Idied) 232, 233

Be'er Resisim 168, 200, 204ⁿ¹⁹, 207, 218

Beersheva Basin 73, 88, 143

Beersheva (Beer Sheba) 31, 132–3, 157, 168, 186, 207, 209, 243, 245

Beidha 92, 101, 109ⁿ⁶

Beit sa'ir 241

Beit Yerah 101, 151

Bergman's rule 16, 24ⁿ¹

Bible 2, 4, 208–9, 211, 235ⁿ³; Abraham 209; archaeology 6, 54, 55–7; biblical chronologies 247; biblical fossils 39; biblical nomads 3; Desert Wanderings 210; illustration 61; Joshua 67; literalism 235ⁿ³; Mount Sinai 176; narrative 4, 211; Patriarch/Matriarch 208–10; patriarchs 62; texts 4, 55, 176, 209–10

bifacial knife 113, 118–22, 125, 150, 165ⁿ³

bipolar naviform cores 102–3

Biqat Hisun 207, 228

bison 14, 98; corral hunting 14; drives 13, 141

Bison antiquus 16

Bison bison 16

bit (bridle) 15, 22, 49

Black Desert 136, 167

Black Sea 45

black tent 213–14, 241, 244

blade tools 149, 152–3, 206

Blemmys 1, 57

Bolling/Allerød period 81

bone morphology 18, 21

bone pathologies 15

bone tools 104

Bos primigenius 12, 16, 81

Bos taurus 16, 22

bow drills 155, 185

bows and arrows 99, 140, 158

breeding: direct and active control of 14

bridles 15, 22, 49

British Mandate 243

Bronze Age: archaeology 54–5; climate of 85–6

Bronze Age Complex 69, 175

burin 103, 121, 149; sites 121

Burma 39

Burqu' sites 116, 125, 133, 139, 150, 153–5

Byblos points 103, 104, 118, 121, 150

Byzantine 58, 60, 61; paganism 232; period 9, 87, 89, 222, 224–5, 227–8, 232, 236n16, 236n23; towns 220, 227, 233, 242

Byzantine Empire 70, 233–4

C3 or C4 vegetation 82, 117

cairn fields 66, 138, 144, 146, 160n3, 162–3, 175, 177, 204n15

calcite 155

calibration (C14) 9, 10, 108n1

camel 17, 24, 209, 220, 233; as a riding animal 29, 158; climate fluctuations 88; distribution maps 88; domestication of 49; dromedary 12, 19, 22; grazing 65; nomads 34, 38, 128, 213

camelid pastoralism 44

Camel Site 69, 101, 133, 139, 168, 169, 171, 174, 180–7, 194–5, 200, 203n11

Camelus dromedarius 12, 22

campsites 22, 56; archaeology 3–4, 7; Bedouin 236n17; hunter-gatherer 97; mobility 59; Nabatean 221, 227–8; nomadism 218; Timnian sites 172, 178, 205

Canaan 61, 182, 187–8, 211, 215, 217

Canaanian blades 182, 203n8, 206

Canaanite sites 188, 217

Canis 14

Canis familiaris 23

Capra 15, 20, 91, 99, 114

Capra aegagrus 18, 91, 99

Capra hircus 22, 91, 99

Capra ibex 18, 99

caravans 28, 31

caravanserai 220–1, 225

carbon isotopes ($\delta^{13}\text{C}$) 79, 83, 85

caribou 48, 52n5

carnelian 155, 184

carnivorous pastoralism 21, 124

carrying capacity 36, 199, 208, 217, 235, 244

cash crops 49

Caspian Sea 45

castration 24n2

cat 11, 13, 17, 24

Catal Hoyuk 12

cattle 12, 19, 22, 88, 128, 137; Coastal Plain sites 120; domestication 13–20, 43; pastoralism 43, 48, 172; Shasu 212; term 235n6

Cave of the Warrior 165n4

cemeteries 4, 162–3, 241–3

ceramics 10, 161, 170, 234, 246; assemblages 68, 156–7, 164, 172–3, 187–8, 230; Bedouin 241–2; dating of 236n23; diversity 199–200; Nabatean 221–3, 227, 236n15; petrography of 187, 202n1; vessels 22, 28, 48, 55–7, 93, 139–40, 198

cereals 19, 31, 42–3, 98–9, 101, 123; domesticated 108n2, 109n5, 143, 198; exploitation 125; gathering of 132; rainfall threshold 88

chaîne opératoire 148, 150, 164, 180, 195–6

Chalcolithic period 9, 23, 101, 112, 132, 135, 137–9, 154, 165, 166n9, 210; assemblages 150, 166n15; beads 155, 185; climate 84–6; copper 77, 157–8, 184, 185–7, 193; dairying 173; Negev society 64; pottery 48, 156–7; sites 69, 190–1; villages 143, 147

chaos theory 64
chenopods 162
chickens 23, 24*n*3, 231
chick peas 95, 101
Christianity 40, 61
chronological framework 9–10
churches 227
churns 22, 48, 93, 139–40, 157, 173
cisterns 4, 40, 89, 210, 218–20, 222, 228, 242–3
cists (burials) 146
classical archaeology 54–5
Classical period 54; archaeologists 56–7; following decline of 237–41; Hayonim cave 59; olive 87; origin and development of nomadism 218–35; rock shelters 116, 139; site plans 229
Classical Period Pastoral Complex 237
climate change: Bronze Age 85–6; Chalcolithic period 84–5; early Holocene 80–3; first millennium BCE 86–7; first millennium CE 87; implications of fluctuations 88–9; middle Holocene 83–4; middle Timnian 84–5; paleoenvironments and 78–87; proxy data 79–80
complex nomadism 33–4, 39
conical clan 36, 64
Conus 146, 155, 184
copper 70, 75, 77, 132, 148, 161, 164, 179, 194, 213, 215, 217; alloys and 185–7; beads 155; demand for 168; economy 193; ingots and molds 170; material culture 164–5; metallurgy 157–8; mining 234; production 197–8, 200, 202; Timnian culture complex 157–8; tools 195–6; trinkets 184–5
core-periphery interactions 167
cornets 157
corrals 13–15, 23, 111
cosmology 131, 144, 147, 163
cottage industry 31, 164, 182, 185
cotton 198
cowrie shells 155
craft specialization 50, 103, 123, 197
culling 99, 124; frequencies 93; herds 21; patterns 19, 21, 23, 28, 91, 172; selective 11, 12
cultural evolution 58, 65, 241
Cyperus 174
Cypraea 155
cypress 81
Cyprus 19–20
Cyrenaica 34, 88

Dabba marble 122, 155
dairy: exploitation 22, 28–9, 48, 124, 139–40, 160; products 160, 173
dairying 11, 21, 22, 173; development of 48–9
Dama 19, 81
Dama mesopotamica 81
Darwin, Charles 15, 55
Darwinian 15, 17, 41, 50, 52*n*3
Darwinism 41, 42, 52*n*3
Dead Sea 75–6, 82, 83, 85, 86, 87, 157, 182, 202

Decline and Fall (Gibbons) 4

deer 19–20, 81

dentalium 155

desert kites 13–14, 23, 140–2, 161, 163, 165, 169, 173

Desert Wanderings 210

Deuteronomy 235*n*9

Dhuwaila 116, 120, 133, 142, 168

dimorphic society 60

Dinka 128

Diodorus of Sicily 220

displacement 39, 126

division of labor 107, 164

DNA 12, 16, 18

dogs 16–17, 27, 90; human-animal interactions 13–14, 20–1

domestication 27; camel 29, 40, 49; cattle 43, 48; donkey 159, 169, 183, 194, 204*n*16; goat 16, 90–4, 111–12, 164; goats 20–1, 24; herd animals in Near East 22–4; horse 45; hunters and 43; identifying 14–22; range of domesticates 11–14; sheep 49, 164

donkey 22–3, 27–8, 44, 49, 159, 169, 183, 194, 204*n*16

drills 149, 153–5, 180–2, 185

dry farming 30, 76, 88

dung layers 15, 19, 22, 59, 68, 92, 111, 99, 114–15, 139, 160, 162, 200, 218; radiocarbon dates from 237, 238; Ramon I Neolithic 117, 132, 173, 198; Stratum III 139

Dyson-Hudson, Neville 53

Early Bronze Age 23, 33; archaeological remains 68; EBI 202*n*1, 204*n*14; EBII 170, 200, 204*n*14; EBIII 113, 200–201, 202*n*1, 204*n*14, 204*n*20, 205–6; EBIV 113, 170, 204*n*14, 204*n*20; site frequencies 190

Early Dynastic Period 44

Early Islamic period 9, 87, 222, 224–5, 227, 232–4, 236*n*16, 236*n*23

earthquakes 234, 236*n*21

East Africa 29, 43, 47, 68, 137

East Coast Industry 134

Eastern Desert (Egypt) 136, 228

economy/economics: complex societies 167–8; Late Timnian 193–9; origins 46; pastoral nomadism 29–32, 193–9

Edom 211–12

Egypt 4, 20, 39, 43, 54, 57, 72, 75, 95–6, 120, 136, 170, 177, 182, 184

Eilat 71, 72, 73, 74, 75, 76, 133, 146, 155, 168, 176–7, 192

Eilatian 113, 134

Ein Gedi 81, 157

Ein Hameara 108*n*4, 168, 174, 184

Ein Hudera 133, 147, 172, 177

einkorn 81

Ein Qadeis 101

Ein Saharonim 207, 220, 225

Ein Shadud 101

Ein Zarqa 144

Ein Ziq 168, 200, 201, 207, 218

el-Amarna: letters 61, 209

el-Arish [207](#), [221](#)
 elephants [11](#), [17](#)
 el-Khiam points [96](#)
 emmer [81](#)
 encampments: excavations of [3](#), [7](#); Late Timnian [168](#), [186](#); nomadic [234](#); pastoral [23](#), [58](#), [67–8](#), [70n3](#), [136–7](#), [139](#), [232](#); summer [106](#)
 Eneolithic period [45](#)
 Epipaleolithic [10](#), [20](#), [81](#), [91](#), [96–7](#), [106](#), [130n3](#), [142](#), [174](#), [178](#), [199](#), [216](#)
Equus asinus [23](#)
Equus bones [192](#), [204n16](#)
Equus equus [23](#)
Equus ferus [18](#)
 ethnoarchaeology [60](#)
 ethnographic analogy [5–6](#), [26](#), [54](#), [63–5](#), [178](#)
 ethnography [2](#), [5–7](#), [53–4](#), [60–1](#), [134](#), [213](#), [215](#), [246](#); ancient nomads [62–5](#); integration with texts [69–70](#); modern [6](#), [54](#), [60](#), [228](#)
 ethnology [6](#); ancient nomads [62–5](#)
 evolution: culture [50](#)
 excavation [66](#), [133](#), [138](#), [246](#); absence of [117–18](#), [160](#); archaeological method [67–8](#); archaeology [3–6](#), [55–7](#), [59](#), [90](#); in Badia [120](#); Camel site [171](#), [187](#); chrono-cultural framework [112–14](#); dating of [142](#), [226](#); Givot Reved [222](#); Late Timnian society [168–9](#), [191](#), [195](#); Nahal Akрав [219](#); Nahal Oded [231](#), [232](#); pastoral encampments [67](#); Shasu [212](#); Shrine 4 at Ramat Saharonim [144–6](#); subsistence [139](#)
 exchange system [106](#), [109n9](#), [120](#), [122–3](#), [129](#), [150](#), [167](#), [169](#), [182](#), [197](#), [235n11](#)
 Exodus [52n1](#), [208–11](#)
 extinctions [16](#), [17](#)
 Ezuz [133](#), [158](#)

faience [155](#)
 falconry [11](#)
 farmer-hunters [90](#)
 fauna: assemblages [4](#), [7](#), [15](#), [18](#), [20–3](#), [69](#), [91](#), [94](#), [111](#), [118](#), [120](#), [127](#), [128](#), [139](#), [142](#), [231](#), [246](#); faunal record domestication evidence [18–20](#)
 Feinan [133](#), [157–8](#), [168](#), [185–6](#), [193](#), [197–8](#), [202](#), [207](#), [212](#), [215](#), [217](#)
 feral [11](#)
 Fertile Crescent [95](#)
 figs [95](#)
 First Millennium BCE: climate of [86–7](#)
 First Millennium CE: climate of [87](#)
 fission [42–3](#), [46–7](#), [50–1](#), [94](#), [97](#), [126–8](#), [202](#)
 four-room house [235n12](#)
 fruits [30](#), [143](#), [175](#), [220](#)
 Fulani [31](#)

Galilee [34](#), [93](#), [155](#), [206](#), [213](#); Sea of [83–6](#)
Gallus gallus domesticus [23](#)
 Garrod, Dorothy [56](#)
 Gaza [31](#), [168](#), [179](#), [207](#), [221](#), [226](#)
 Gaza Ware [226](#), [237](#), [239](#), [241](#)

gazelle 13–14, 18–20, 20, 23, 42, 108ⁿ⁴, 120, 144; dung pellets 114; hunting 23, 91, 93, 140–2; mass killing of 163; subsistence 172–3

Genesis 210

genetics 12, 15, 17–18

geoglyphs 144

Geographic Information Systems (GIS) 67

Geometric Kebaran 96–7

Gerar 207, 209

Ghab Basin 81

Ghassul 133, 157

Ghassulian culture 113, 132, 143, 154, 157, 164, 168, 173, 185–6

Ghazalian 110

Givot Reved 207, 222–5, 236ⁿ¹⁷, 240

goats 13, 20, 21, 22, 24; climate fluctuations 88–9; domestication 16, 20–1, 24, 90–4, 111–12, 164; grazing 65

Gobekli Tepe 143

Golan Heights 177

gold 184; beads 192, 194, 198

Google Earth 56, 137, 226, 245

grain 28, 31, 105, 123; exchange 175; import 198, 218, 232; processing 63, 153; trade 31

grapes 143

Grass: A Nation's Struggle for Survival (documentary) 32

grave goods 177, 192, 204ⁿ¹⁵

green stones 77, 95–6, 98, 106, 123, 155, 185

grinding stones 63, 104, 143, 153–4, 183

guanaco 44

Gulf of Aqaba/Eilat 71, 72, 74, 75

Gulf of Suez 74

guns 32, 40, 213

Habiru 211, 213, 215

Haloxylon salicornici 74

Halutza 207, 220, 227, 232

Hamifgash 118

Haparsa point 104, 121

hare 143, 172

Har Harif 130, 133, 138, 165

Har Horsha 168, 174

Harifian 20, 33, 96, 106, 199, 216

Har Karkom (Mount Karkom) 168, 175, 176

Har Michia 133, 149, 158, 159

Har Qeren 116, 118, 119, 120, 151

Harrapan 11

Har Sagi (Saggi) 172, 174

Har Sayad 168, 200

Har Yeruham 168, 200

Hasmoneans 220

Hatoula 18

Haweitat 39

hazerim 214, 235n9
 Hebron 168, 178
 Hellenistic period 9, 87, 210, 220–1
 Helwan point 103, 104
 hematite 154, 194, 195, 196
 herder-gatherers 110–30; chrono-cultural framework 112–14; desert chronological terminologies 113; domesticated animals 110–12; earliest evidence of 114–22; first desert pastoralists 122–9; map of southern Levant 116; Ramon I Rock Shelter 115
 herds: exploitation of 27–9; Near East 22–4
 Herzliya points 121, 150
 Hesban 4, 168, 179
 Heshban 69
 Hieronymus of Cardia 220
 historical archaeology 3, 10n1, 54–6, 58, 66, 70n2
 historical particularism 64
 holemouth vessels 156, 157, 175, 187, 200, 202n2
 Holocene 10, 16, 121, 216; climate 20, 43, 47, 78, 97; climate of early 80–3; climate of middle 83–4; Pleistocene/Holocene transition 17, 42; rainfall 84
 honeycomb pattern 103, 125, 134
 horizontal nomadism 33, 59
 horizontal stratigraphy 67, 200
 horse 11, 14, 16, 18, 23, 27–9, 44–5, 49, 217, 247
 Horvat Beter 101
 Hujayrat al-Ghuzlan 101, 168, 170, 174
 Huleh Basin 81
 human-animal interactions 13–14, 20–1
 hunter-gatherers 25–6, 53; age profiles 70n3; archaeological remains 65–9; archaeology of prehistoric 58; migration 33; primary agents of domestication 43
 hunting 4, 11, 14–15, 18–20, 23; bands 53, 106–7, 122–4; economy 97–8; facilitation 44; guns 32; herding replacing 46; strategies 21, 23, 91; subsistence 163–4; *see also* arrowheads
 hunting-gathering 3, 31, 42–3, 46, 52n2; economy 160, 199; first desert pastoralists 122; Navajo subsistence 128; Pre-Pottery Neolithic B (PPNB) 90, 96, 98, 111–12, 216; transition to pastoralism 26, 132
 hunting-gathering-farming: origins 42–6
 Hyksos 210

 ibex 114, 123, 159, 172
 ideology: pastoral nomadic people 36–7
 India 48, 220
 Indian Ocean 73, 79, 82
 intensification 51, 93, 110, 124, 162, 165, 169, 173, 179, 188, 192–4, 198, 202
 Intermediate Bronze Age 9, 169, 190, 200, 204n20, 205–7, 217
 Inuit 48
 Inuit societies 48
 Iran 111, 167, 214
 Irano-Turanian zone 74, 75, 76, 80, 88, 109
 Iron Age 8, 9, 23, 45, 86, 208–12, 214, 216, 218; archaeology 54–6; ethnography of pastoralists 63; Heshban 69, 179; hill fort at Nahal Akrav 219
 irrigation 51, 81; canals 51; run-off 30, 88–9, 170, 199, 206, 218, 227–8, 234, 244

Islam [40](#), [213](#), [236n22](#)
 isotopic analysis [82](#)
 Israel [18](#), [40](#), [71](#), [76](#), [79](#), [81–2](#), [86](#), [92](#), [143](#), [210–11](#), [221](#), [232](#), [237](#); archaeological survey of [135](#), [190](#), [229](#); ceramic frequencies [223](#); size of Negev and [245–6](#); State of [244](#)
 ivory [184](#)

Jafr Basin [73](#), [77](#), [121](#), [136](#), [148](#)
 Jawa [167](#), [168](#)
 Jebel Gunna [133](#), [147](#)
 Jebel Jill [133](#), [143](#), [168](#), [172](#), [174](#), [183–4](#), [203n6](#)
 Jebel Naja [155](#)
 Jebel Rubsha [101](#)
 Jerf el-Ahmar [143](#)
 Jericho [55](#), [101](#), [103](#), [105](#), [143](#), [168](#), [184](#)
 Jericho point [104](#)
 Jerusalem [34](#)
 jewelry [32](#), [105](#)
 Jezreel Valley [34](#)
 Jilat [92](#), [101](#), [103](#), [116](#), [120–3](#), [125](#), [127](#)
 Jordan [4](#), [31](#), [66](#), [69](#), [71](#), [73–4](#), [76–7](#), [79](#), [81–2](#), [92](#), [94–9](#), [102](#), [109n6](#), [114](#), [120–7](#), [134](#), [136–9](#), [142–3](#), [146–8](#), [153](#), [162](#), [167](#), [172](#), [177–9](#), [183–4](#), [186](#), [188](#), [191–3](#), [197](#), [206](#), [211–14](#), [216](#)
 Jordan Valley [82–3](#), [85](#), [123](#)
 Joseph (biblical character) [210](#)
 Joshua (biblical book) [67](#)
 Judea [182](#), [206](#), [220](#)
Junctus arabicus [74](#)
Juncus [74](#), [174](#)
 juniper [84](#), [175](#)

Kadesh Barnea (Qadesh Barnea) [116](#), [118](#), [125](#), [168](#), [174](#), [207](#), [210](#)
 Kalahari [7](#), [39](#), [98](#), [123](#)
 Kfar Horesh [133](#), [143](#), [166n10](#)
 Khirbet Kerak ware [199–200](#)
 Kinneret (Sea of Galilee) [84](#), [85](#)
 !Kung [52n2](#)
 kurgan [6](#)
 Kvish Harif [101](#), [133](#), [138](#), [148](#), [153](#), [156](#), [168](#), [186](#), [191](#), [193](#), [195](#), [203n11](#)

labor [31](#), [35](#), [107](#), [124](#), [163–4](#), [179](#), [192](#), [229](#)
 lactase [29](#), [48](#)
 lactose [48](#)
 lactose intolerance [48](#)
 lake levels [79](#), [82](#), [86–7](#)
Lama glama [44](#)
Lama guanaco [44](#)
Lambus [155](#)
 land snails [79](#), [82](#), [83](#), [85](#)
 Last Glacial Maximum [97](#), [216](#)
 Late Bronze Age [9](#), [23](#), [45](#), [80](#), [86](#), [190](#), [214](#), [216](#), [218](#), [235n7](#), [236n12](#)

Late Neolithic 22–3
 Late Stone Age 43
 Late Timnian 168–9; Camel Site 171; ceramic assemblages 187–8; chipped stone industries 179–82; collapse in desert 199–202; copper and alloys 185–7; cult and mortuary sites 175–7; demography and social organization 188–9, 191–2; domestic architecture and settlement 169–72; economic asymmetry 199; economy of 193–9; ground stone industry 183; imported and exported goods 195–6; material culture of 179–88; mobility and seasonality 177–9; multi-resource nomadism 199; shells, beads and trinkets 184–5; site frequencies 190; small flake industry 180; subsistence systems 172–5
 Lebanon 92, 211
 legumes 143
 leopard traps 142
Lepus 99
 Levant: climate and environment of southern 78–87; map of 72; rainfall patterns 75; seasonal distribution of rainfall 73; southern 71–7; vegetation map 74; vegetation zonation 74
 Libya 48
 lichen 81
 limes 58
 limestone rings 154
 linen 198
 lithics 106, 127, 148–53, 169, 206; *ad hoc* 148–9, 153
 llamas 27, 44, 49
 locus-basket method 67
 Lod 34
 logistical mobility 33
 loom weights 198
 lost wax casting 157, 186–7
Luna glama 44
 lunate 96, 104, 142, 150, 172–4, 181
 Luristan 31
 Lurs 31, 33
 Lyell, Charles 55, 64

 Ma'aleh Shoharut 155
 Ma'an 92, 106
 mace heads 154, 157, 194
 Maitland's Mesa 133, 147, 155, 177, 192
 maize 90, 109n9
 Makhtesh Ramon 89, 114, 117, 141, 153, 166n8, 183, 197, 222, 228, 236n20, 240, 242–3
 Mamshit 207, 220, 227
Man the Hunter (Lee and Devore) 53
 Mari 57, 60, 206, 213–14
 markets 26, 28–33, 35, 40, 50, 64–5, 89, 98, 128–9, 162, 168–9, 179, 201, 227, 246
 Masai 32
 Mashabe Sade 168, 200
massebot 144, 175–6, 225
 Maya 55
 Mediterranean 9, 29, 75, 78–9, 84, 87, 132, 220
 Mediterranean zone 9, 47, 67, 71, 170, 177–8, 208, 216; beads 155; chipped stone industries 181–

2; copper 186, 202; economy 198; geographic variability 77; Negev 75–6; regional rainfall and vegetation 75; seasonal distribution of rainfall 73

megaliths 160, 162–63, 177

Megiddo 133, 151, 182

Mesopotamia 4, 20, 46, 47, 73, 77, 173, 182, 198, 203n5; archaeology 57, 60–1; civilization 24, 39, 49, 54–5, 61, 167, 213; iconography 61

metal 32, 55, 124, 164, 184, 197; copper 157–8, 185–7, 202n1

Metis 98

microlithic drills 149, 153, 154, 180–2, 185

Middle Bronze Age 9, 23, 190, 202, 206, 208–9, 216–17, 235n1

Middle Paleolithic 14

middle range theory 63, 64

Middle Timnian: climate 84–5

migrations 46, 178, 202, 212, 239; seasonal 25, 28, 30, 39; seasonality and 32–6

milling stones 40, 77, 148, 164, 169, 224; industry 183; Late Timnian 174–5; manufacture 69, 107, 153, 193–4, 197–8, 200; movement of 179; rotary 40, 232

Minimum Number of Individuals (MNI) 22, 94, 108n4

Mitzpe Shalem 168, 182

mobile pastoralism 4, 11, 126, 129, 218, 220, 245; desert society 45–6, 132; misapprehension of 59–60; rise of 49; structure of 54–9

mobility: seasonality and 177–9; sedentism and 25, 30, 107, 187, 219, 223, 243–4

monastic settlements 228

Mongols 40

monsoons 32, 73, 79, 82

morphological change 12–13, 15–18, 20, 22, 49, 91

morphological criteria: domestication processes 15–16

mortuary behavior and cult 107, 123, 127, 143–7, 169, 175–7

mosques 232, 234, 241

mother-of-pearl 155, 194

Mount Sinai 52n1, 176

Mt. Sedom 86

Munhatta 101

Mushabian 109n7

Muslim conquests 233–4

Mus musculus domesticus 11

mythology 1–3

Nabateans 1, 28–9, 31, 45, 57, 77, 220–8, 233, 236n14–16, 240; ceramic class frequencies 223, 227; Classical Period 220–8; Ein Saharonim caravanserai 225; Google Earth 226; nomadic sites 224; settlement distributions 222

Nahal Akrav 219

Nahal Boker 101

Nahal Divshon 106

Nahal HaRoa 207, 218

Nahal Hilazon 21

Nahal Issaron 92, 116, 133, 156

Nahal Lavan 92, 96, 101

Nahal Mishmar 133, 157

Nahal Mitnan 101, 168, 174

Nahal Nizzana [151](#), [168](#), [185](#), [219](#)
 Nahal Oded [23](#), [87](#)
 Nahal Paran [76](#)
 Nahal Ramon [197](#), [223](#)
 Nahal Tsafit [101](#), [133](#), [135](#), [138](#), [146](#), [148](#), [153–4](#), [156–7](#), [168](#), [186](#), [193–5](#), [203](#)ⁿ¹¹
 Nahal Zin [84](#)
 Natufian [14](#), [20](#), [23](#), [33](#), [59](#), [91](#), [96–7](#), [106](#), [132](#), [163](#), [166](#)ⁿ¹⁶, [199](#)
 natural selection [17](#)
 Navajo [46](#), [65](#), [128](#)
 Nawamis [147](#), [172](#), [175–8](#), [186](#), [192](#)
 nawamis tombs [155](#), [157](#), [161](#), [184–6](#)
 Near East: herd animals in [22–4](#); historical archaeology [66](#); prehistoric archaeology [55–6](#)
 Nebi Salah [168](#)
 Negbite ware [232](#)
 Negev [66](#), [75–6](#); map of [76](#)
 Negev Emergency Survey [191](#), [221](#)
 Neolithic period [3](#)
 Neolithic Revolution [90](#)
Nerita [155](#)
 Nile [43](#), [109](#)ⁿ⁷, [184](#); Delta [39](#)
 Nizzana (Nessana) [60](#), [61](#), [69](#), [220](#), [233](#); Papyri [61](#), [69](#)
 Nizzanim [113](#), [118](#)
 Nizzanim phase (Pottery Neolithic) [112](#)
 Nizzanim points [104](#), [121](#), [150](#)
 nomadism [25](#); development of nomadic states [45](#); origin and development of Classical Period [218–35](#); *see also* [pastoral nomadism](#)
 nomads: ancient texts and [60–2](#); ethnography, ethnology and study of ancient [62–5](#); implications of archaeological methods [65–9](#); integrating texts, ethnography and archaeology [69–70](#); invisibility of [53–4](#); mythology of [1–3](#); pastoral [64](#); role of archaeology [3–6](#); structure of discipline [54–9](#); visibility of [60–70](#); *see also* [pastoral nomadism](#)
 North Africa [1](#), [19](#), [31](#), [114](#)
 North Arabia [32](#), [39](#), [72–3](#), [134](#), [136](#), [220–1](#), [227](#)
 North Arabian saddle [29](#), [40](#), [49](#)
 Northwest Coast Indians [163](#)
 Nuer [27](#), [37](#), [128](#)
 Number of Identified Specimens (NISP) [22](#), [172](#)
 Numeira [168](#), [175](#)

 oak [74](#), [81](#), [84–5](#), [87](#)
 oasis theory [42](#)
 obsidian [95](#), [106](#), [123](#), [129](#), [158](#), [184](#), [194–6](#)
 Oded sites [228](#), [230](#), [232](#)
 Ohalo II [92](#), [108](#)ⁿ², [132](#)
 Olduvai [7](#)
Olea [81](#)
 olive [81](#), [84–5](#), [87](#); oil [198](#); presses [227](#)
 onager [22](#), [140–2](#)
 optimization [26](#), [34](#), [50](#)
 oral histories [4](#), [239](#)

Orientalism/Orientalists 39, 52n1, 62, 241

Orientalism (Said) 61

origins: baselines, fission, adoption and economics 42–6; issues of causality 46–51

OSL (optically stimulated luminescence) 143

ostrich eggshells 143, 154–5, 172, 184–5

Ottoman Gaza Ware pottery 237

Ottoman rule 30, 32, 40, 241–3

overgrazing 47, 126

Ovis 114

Ovis aries 18, 22

ox 49

oxygen isotopes ($\delta^{18}O$) 84

pack animals 22, 28, 40, 70, 105–6, 109n9, 136, 164

paleoenvironments: Bronze Age 85–6; Chalcolithic period 84–5; climate change and 78–87;

early Holocene 80–3; first millennium BCE 86–7; first millennium CE 87; middle Holocene 83–4; middle Timnian 84–5

Paleolithic 3, 14, 19, 39, 55, 58–9, 134, 158, 176

Paleolithic period 3

paleontological approach: identifying domestication 15, 16

Palestine 55, 92, 237

pastoralism: misapprehension of mobile 59–60; *see also* mobile pastoralism

Pastoral Neolithic 43

pastoral nomadism 25–7, 45; after revolutions 246–7; archaeology of 56; archaeology of end of 237–41; chronological framework 9–10; demography and social organization of Late Timnian 188–9, 191–2; economy 29–32, 193–9; goals of study 6–9; introductory mythology 1–3; issues of causality 46–51; migrations and seasonality 32–6; origins 42–6; problem of definition over time 38–42; role of archaeology 3–6; structures of society 36–8; treatment in texts 57–8; use of animals 49; variability over time 51–2; *see also* nomads

pastoral nomads 64; treatment in texts 57–8

pastoral zonation 89

Patriarch/Matriarch 208–10

pen and attached room 118, 121, 134–8, 142, 160, 162, 169–72, 176, 189

pens 22, 92, 136–7, 139, 160, 171, 173, 200, 218–19, 222, 226, 228

Pentateuch 209

Persian Gulf 24, 32

Persian Wars 234

Petra 92, 109n6, 207, 220–1, 224, 226

petroglyphs 142, 158–9, 224

phenotypes 16

Philistines 210, 215

Phoenix dactylifera 74

phytoliths 68–9, 95, 99, 101, 109n5, 143, 162, 174, 198

pigs 11, 14, 17

pilgrimages 31, 60–2, 228, 233

pillared house 235n12

Pinctata 155

Pistachia atlantica 74

pithoi 157, 175

plaster production 107, 126
Pleistocene 16–17, 19, 33, 42, 53, 64, 78–9, 216
Pleistocene-Holocene transition 17, 42
Pleistocene societies 64
plough 15
pluvial lakes 79, 90
pollen 19, 78–9, 82, 162, 166*n*13; data 81, 83–5, 87
population pressure 51
post-cranial bones 18, 21
pottery 31–2, 90, 93, 156–7, 164, 166*n*10, 186–8, 198, 202*n*1, 217, 221, 226–7, 236*n*22
Pottery Neolithic 94, 118, 132, 137, 139, 150, 155, 190
PPNB Interaction Sphere 72, 95, 122
PPNB megasites 122
preciosities 179, 184
prehistoric archaeology 54–6, 58, 66–7
Pre-Pottery Neolithic A (PPNA) 18, 20, 55, 82, 90–2, 96, 98, 125, 216
Pre-Pottery Neolithic B (PPNB) 8, 9, 20, 44, 47, 55, 132, 153; architecture 102–3; arrowhead types 104; beads 155; chrono-cultural framework 112–14; climate of 81–4; collapse of 47, 83, 110, 124, 126, 129; domestic architecture and settlement 134, 136–8; early evidence 118–22; first desert pastoralists 122–9; goats in 90–4, 110–12; material culture of 103–5; origins in Negev PPNB 94–8; pollen data 81; society in desert 105–8; subsistence in desert in 98–9, 101–2, 139–43
Pre-Pottery Neolithic C (PPNC) 44, 84, 93–4, 99, 113, 118, 120, 124–7, 129, 134, 139–40, 148, 150, 160
Pre-Pottery Neolithic period 23, 190
pressure retouch 140
primary products 28
Principles of Geology (Lyell) 64
privatization 162
pyro-technologies 123, 127

Qa' al al Ghiqra 155
Qasis 100, 152
Qatifian 112–14, 143, 156–7, 166*n*11
quarries 4, 103, 120, 137, 149, 197
quarry site 106, 113, 118, 148, 178–9, 181–3, 194, 197
quartz crystals 184
Qubur al-Walaydeh 207, 215

radiocarbon dates 9, 10, 78–9, 96, 112, 114–16, 118, 136, 138, 144, 146, 157, 170, 173, 176, 203–4*n*14, 208, 232, 237–8; 1st millennium CE 238–9; Levantine Mediterranean zone 96; Ramon I Rock Shelter 114, 115; southern Levantine chronology 9
raiding 31, 35, 46, 128, 212, 234
Ramat Matred 168, 174
Ramat Saharonim 133, 144–6, 163, 166*n*8, 176, 192
Ramon Rock Shelter 114–18, 124, 133, 139, 162, 165*n*1
ranching 11, 13, 27, 43–4, 141
Rangifer tarandus 52*n*5
Rasm Harbush 101

reconnaissance 56, 66
Red Sea 74–5, 77, 96, 105, 122, 155, 184
Rehovot-ba-Negev 207, 220, 236ⁿ¹³
reindeer 17, 27, 45; adoption of domestic 65; herd 12; herders 12, 16, 26, 46, 161; hunters 13, 161;
 hunting 13; pastoralists 33, 43
Rekhes Nafha 168, 169, 173, 185, 200
remote sensing 66–7
residential mobility 30
residue analysis 93, 139
Rift Valley 71, 74, 76, 77, 129, 137, 178, 185, 212
risk reduction 50, 98
rock art 4, 20, 61, 158–9, 161, 163, 169, 175, 227, 232, 241; Negev 61
rock shelters 111, 114–18, 124, 133, 139, 160, 162, 168, 173, 198, 218, 237–8, 241–2
Roman Empire 4, 233
Romans 1, 40
Rosh Horsha 101
Rub al Khali 32
Ruwalla 34, 38, 59, 66, 213

Saami 48
Saharan lakes 79
Saharo-Arabian zone 74, 76, 80, 88
Sahel 32
Salibiya 82
sandstone 77, 153, 183, 193, 197, 232
Saracens 1, 57, 62, 233, 235
Sassanid Empire 234
Sataf 101
satellite reconnaissance 56, 137
sayaj 244
scientific techniques 55, 59, 64, 68
Scythians 1
Sea of Gallilee (Kinneret) 84, 85
sea shells 77, 105, 122–3, 155, 184–5, 194
seasonality 5, 21, 147, 172; migrations and 32–6; mobility and 177–9; patterns 169; study of 68–
 9, 136
secondary products 23–4, 28, 48, 124, 132; revolution 18
second millennium BCE: absence of archaeological remains 209–12; model for archaeological
 absence 216–18
Sede Boker 207, 234
sedentism 13, 67, 98; mobility and 25, 30, 107, 187, 219, 223, 243–4; nomadism and 39–40, 51;
 seasonality and 21
segmentary lineages 26, 36, 38, 64
Seir 211
semi-nomadic groups 59, 205, 214
Senegal 31
Serabit el Khadim 133, 157
sharecroppers 30
Shasu 61, 62, 211–15, 233

sheep 19, 24; bones 68–9; breeding 93; climate fluctuations 88–9; domestication of 13, 94–5, 99; dung layer 114, 117; goats and 120, 131–2, 138, 160–1, 164–5, 169, 212, 231, 235n6, 244; in nomadic states 45–6; pastoralism 65; shears 151–2; subsistence system 122–9, 139–43, 159, 172–5

Sheikh ‘Awad 168

Sheikh Mukhsen 168, 175

shig 228

Shiqmim 85, 101, 133, 143, 151

Shivta 207, 220, 227, 232, 234

sickle blades 63, 95, 101, 109n5, 153

silos 101, 242

Sinai 31, 33, 37, 58, 61, 62, 66, 69, 77, 79, 94–5, 97–9, 112, 122, 125, 134, 143, 148, 150, 167, 178, 228, 241–5; Central 75, 114, 118, 147, 176, 192; Northern 75, 76, 221; Peninsula 71, 74; *see also* South Sinai

Sinai Peninsula 71, 74–5

skeletal remains: aging 21; sexing of 21

snail shells 79, 82, 83, 85, 86, 239

social fission: society 50

solstice 144, 145, 166n8

Solubba 197

Soreq Cave 84

southern Levant 71–7; climate and environment 78–87

South Sinai 30, 32, 34, 72–3, 75, 81–3, 95, 98–9, 101–3, 105–6, 136–8, 140, 142, 144, 151, 155, 168, 170, 175, 181–2, 184–5, 187–8, 191, 193, 198, 200, 217, 233

Southwest (American) 46

speleothems 10, 78–9, 82, 87; isotope data 83–4, 86

spherulites 15, 68, 99, 173

Spice Route (Incense Route) 220–2

spices 29, 220

spindle whorls 198

squatters 66–8

stabling 56, 111, 114–17, 132, 139, 160, 162, 173, 198, 237, 241

State of Israel 244

steatite 155

stelae 144, 175, 176, 226

stirrup 29

Stone Age: archaeology 58–9

stratification (social) 38

stratigraphy 56, 67, 69, 116, 136, 169, 200

subsistence economy 3, 29–32, 45–6, 95, 110, 124, 131, 199

Sudan 214

Sudano-Deccanian zone 74, 76

sugar 32

summer solstice 144, 145, 166n8

survey: archaeological method 66–7

Sus scrofa domesticus 22

Syria 4, 81, 92, 136, 141–2, 177, 211

tabular scrapers 77, 148–52, 154, 161, 164, 166n15, 170, 177–82, 193–7, 200, 203n9, 204n19, 206,

235n11; characterization of 166n15; chipped stone industry 179–82; cortical incisions on 181; economy 193; imported and exported goods 195, 196; production 148–52, 154; production of 164, 177–9; transition from tabular knives 161

Tabun Cave 56

Tall al-Magass 168, 170

Tamarix 74

tea 32

Tel Aviv 34

Tel Kuran 141

Tell Banat 214

Tell Halif 168, 202

Tell Hesi 168, 200, 202

tells 55–7, 212, 214

Tel Tsaf 101

tents 40, 49, 56, 61–3, 136, 213–14, 222–3, 228, 236n12, 242, 244

Tepe Ganj Dareh 16, 21, 91–2, 111

Tepe Tūlā'i 68

Terminal Timnian system 202, 208

terraced fields 87, 222, 236n16, 236n20, 242

territoriality 23, 106–7, 162–3, 242

tethered nomadism 33

textiles 115, 123, 173; import of 198; production 46, 49, 136

texts 216–17, 233; Arabic 234; Bedouin 213–15; biblical and classical 55; Egyptian 208–12; Hieronymus of Cardia 220; historical 10n1; integration with ethnography and archaeology 69–70; Mari 47, 57; nomads and ancient 4, 57–8, 60–2; pastoral nomads in 57–8

Thamudic inscriptions 227

threshing floors 175, 228

Tiberias 206, 232, 234

tile knives 118, 121, 150

Timna 133, 155–7, 185–6, 217; Site 39 157

Timnian: term 112, 113; *see also* Late Timnian

Timnian culture complex 132–3; beads of 154; copper 157–8; cult and mortuary sites 143–7; definitions 133–4; desert tribal society 165; domestic architecture and settlement 134–8; enclosure and attached room sites 135; end of 205–8; grinding stones 153–4; integrating processes in 159–65; lithics of 148–53; map of 133; material culture 148–58; pottery of 156–7; rock art of 158–9; stone artifacts 153–4; subsistence of 139–43; *see also* Late Timnian

tobacco 32, 242; pipes 32, 242

tortoise 21, 99

tower tombs 147, 177

trade 246; agreements 61; agriculture 99; animals 128, 233; copper 70, 164–5, 172, 184, 186–8, 193; economy 193–9; goods 122, 129, 183; material culture 164; metals 157; organization of 50; patterns 168; sheep 46; shell 105; systems 7, 18, 28, 30, 31, 40, 73, 77, 108, 120, 123, 178–9, 221; Timnian system 217; tools 161

trade stations 4

transport: animals 49

transverse arrowheads 104, 112, 121, 124, 130n5, 140, 142, 150, 154–5, 161, 174, 177, 181

tribes: Bedouin 30, 34–5, 37–9, 237, 239, 241; desert 1–2, 70, 165, 233; nomadic 45, 50, 61, 232; North Arabian 220, 227; pastoral 61; pastoral nomadic society 36–8; Yoruk 31

trinkets 184, 192

troughs [15](#), [22](#), [85](#), [92](#)
Tuareg [28](#), [31](#), [36](#), [38](#), [221](#)
tumuli/tumulus [138](#), [146](#), [160–1](#), [175–8](#), [181](#), [192](#), [203](#)ⁿ¹¹, [204](#)ⁿ¹⁵
Tumulus Site [695](#), [151](#)
Turkey [31](#), [48](#), [81](#), [143](#), [184](#), [186](#)
turquoise [75](#), [155](#)
Tuwailan [84](#), [110](#), [112–13](#), [118](#), [125](#), [134](#), [150](#)

Ujrat el Mehed [92](#), [98–9](#), [101–2](#), [125](#)
Ummayad [233](#)
uniformitarianism [64](#)
Uruk [44](#), [167](#)
Uvda Valley [30](#), [83](#), [92](#), [133](#), [153](#), [156](#), [168–9](#), [181–2](#), [198](#); Site 124 [175](#); Site 16 [101](#); Site 17 [101](#), [175](#);
Site 18 [101](#); Site 6 [144](#); Site 7 [138](#); Site 917 [169](#)

vertical nomadism [33](#), [178](#)
Vicugna pacos [44](#)
Vicugna vicugna [44](#)
vicuña [44](#)
v-shaped bowls [157](#)

Wadi Ar-Riwaq [82](#)
Wadi ath-Thamad [82](#)
Wadi Faynan [82](#)
Wadi Feiran [133](#)
Wadi Feiran industry [134](#)
Wadi Fidan [158](#), [166](#)ⁿ¹¹, [168](#), [170](#), [184](#)
Wadi Gaza sites [148](#), [166](#)ⁿ⁹
Wadi Hasa [92](#), [109](#)ⁿ⁶
Wadi Hisma [137](#)
Wadi Jenah [140](#)
Wadi Jibba [101](#), [116](#), [118](#), [125](#), [133](#), [155](#)
Wadi Makkukh (Cave of the Warrior) [165](#)ⁿ⁴
Wadi Mara [142](#)
Wadi Qusayr [133](#), [148](#)
Wadi Rum [94](#), [99](#), [101](#), [106](#)
Wadi Tbeik [92](#), [98](#), [101](#)
Wadi Thuwaythuwat [133](#), [168](#)
Wadi Ziqlab [92](#), [108](#)ⁿ³
water tanks [32](#)
wells [40](#), [89](#), [210](#), [228](#), [232](#), [235](#)ⁿ⁵
wheat [88](#), [95](#), [99](#), [101](#), [175](#)
wheel [29](#), [40](#), [227](#)
Wheeler-Kenyon method [56](#)
Winckelman, Johann Joachim [55](#)
wine presses [227–8](#)
winter solstice [166](#)ⁿ⁸
Wisad Pools [177](#)
wolf [12–14](#), [16](#), [21](#), [23](#), [90](#)

wool [49](#); alpacas and llamas [44](#); animals for [173](#); exploitation [13](#), [21](#), [24](#), [128](#), [152](#); production [93](#), [198](#); products [28](#); sheep [49](#); spinning [173](#); use [21](#)

world system [40](#), [167](#)

wusum [241](#)

Yarmouth [152](#)

Yarmukian [113](#), [118](#), [156](#)

aylag pastoralism [213](#)

Yiftahel [20](#), [92](#), [93](#), [100](#), [101](#), [108n4](#)

Yoruk [31](#), [38](#)

Younger Dryas [19](#), [82](#), [97](#)

Younger Fill [87](#)

yurts [214](#)

Zagros [18](#), [28](#), [32](#), [213](#)

Zalzal Cave [133](#), [157](#), [239](#)

Zawi Chemi Shanidar [21](#)

Zimri Lin [214](#)

Ziqim [116](#), [118](#)

zoarchaeology [7–8](#)

zoological approach [15](#)

Zulu [45](#)

Zygophylletum dumosi [74](#)